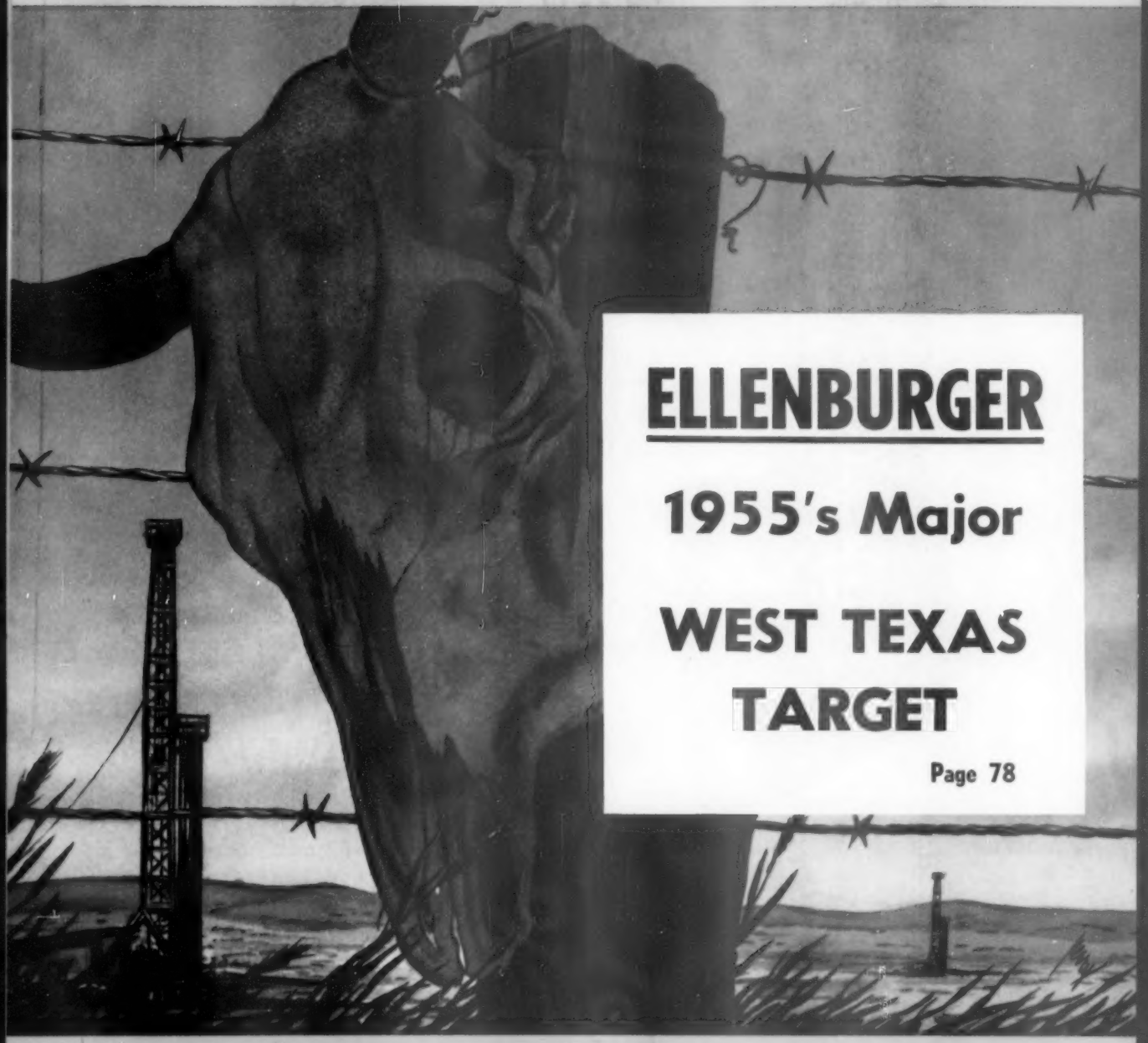
JANUARY 3, 1955

the OIL AND GAS JOURNAL



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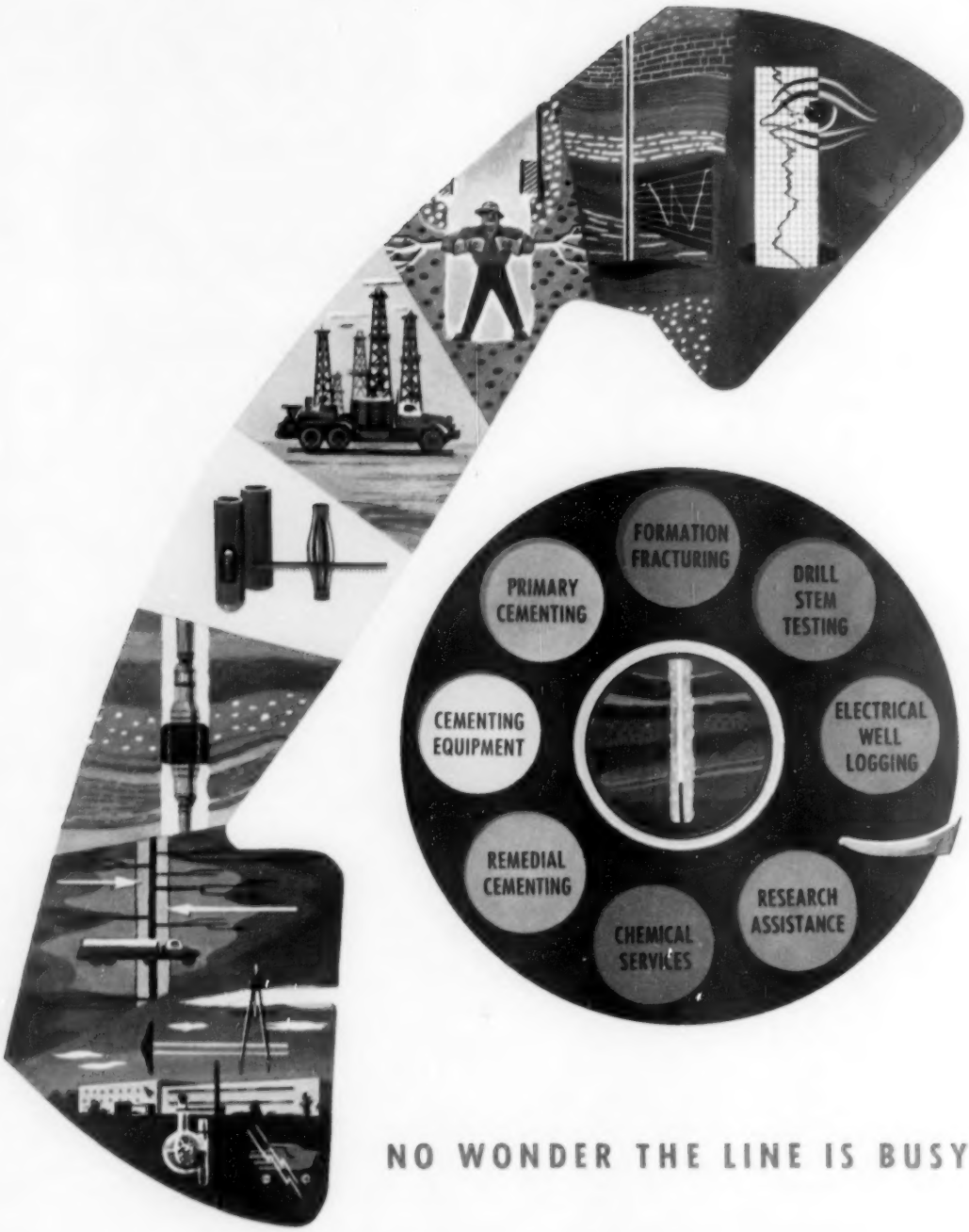

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JANUARY 3, 1955 VOL. 53 NO. 35

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In Brief . . .

1. PROMISING AREA . . . Untapped pre-Permian structures with vast oil reserves underlie many of the known Permian producing areas in West Texas. Production from these future oil fields may even exceed that from present pre-Permian pools. West Texas exploration efforts are geared to locating these new Ellenburger reserves at drilling depths of 12,000 to 14,000 ft. Ellenburger wells are prolific, with many of them falling in the million-barrel class. Subsurface geology and seismic work are proving the best exploration methods.

2. MICROWAVE RELIABILITY . . . United Gas Pipe Line Co. has installed a 5-hop microwave system in Mississippi operating on 2,000 megacycles. The original purchase contract specified that the system should have a propagation reliability of 99.5 per cent for a 6 months' test period, and measurements made to date indicate that an adequate margin has been provided to meet this requirement.

3. IMPROVED DISTILLATES . . . The Hydrofining process offers an excellent means of finishing kerosines, heating oils, and diesel fuels. Increased attention is being given to these middle-distillate materials due to the current emphasis on product-quality improvement in the competitive petroleum market. Hydrofining is especially attractive when by-product hydrogen is available from catalytic naphtha-reforming operations.

4. EFFICIENT FLOOD . . . The Hildreth unit, first deep reservoir in Montague County, Texas, to be unitized for gas injection and water flooding, is furnishing the operators valuable indications of the floodability of other conglomerate reservoirs in the area. Accumulated oil production is six million barrels, with about 1,000,000 attributed to the flood. About 98 per cent of present production is secondary oil.

5. ELECTRIC CONTROL . . . The first of twin, all-electrically controlled, 60,000-bbl.-per-stream-day crude-distillation units has been put on stream at Anglo-Iranian's Aden refinery. The unit is controlled from a central control room of unconventional design. Control panel is designed for maximum utility and for extremely fast maintenance work.

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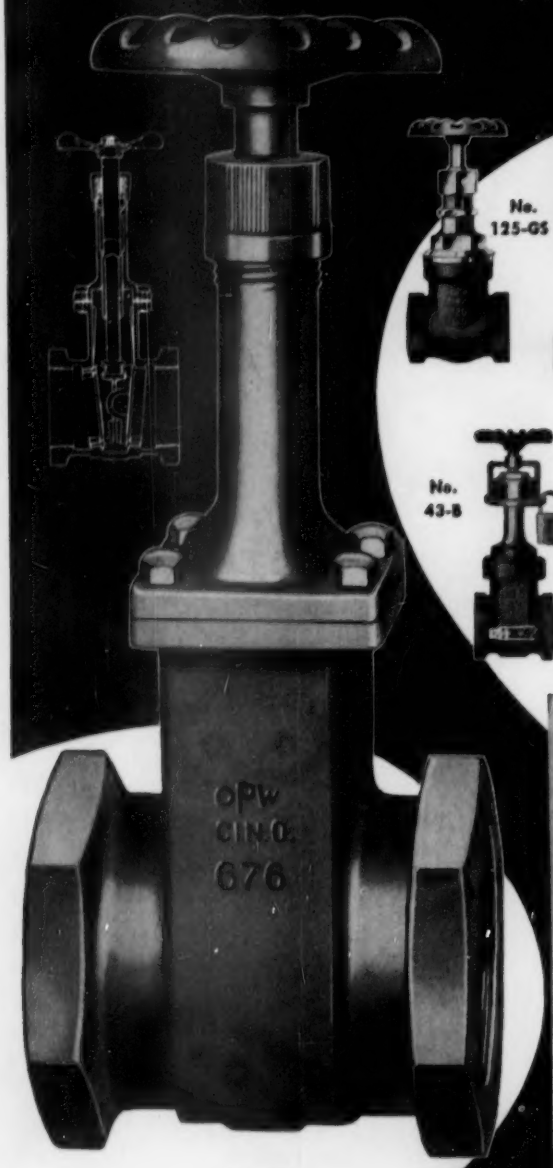

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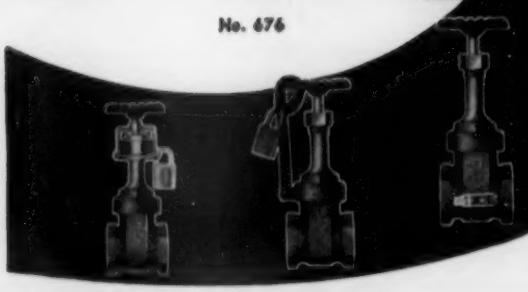

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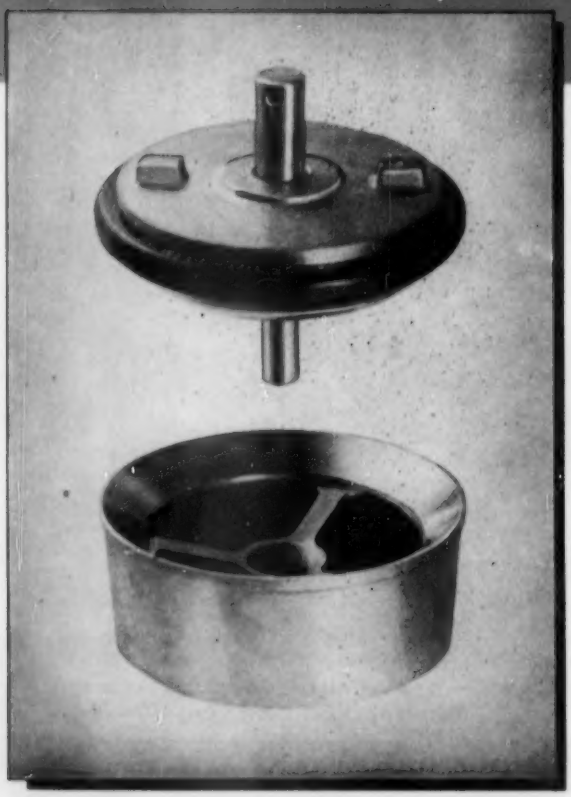

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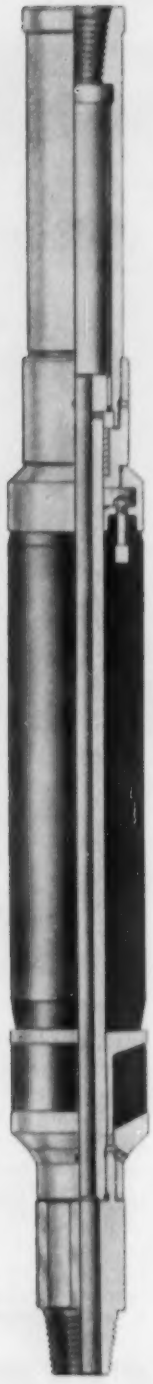

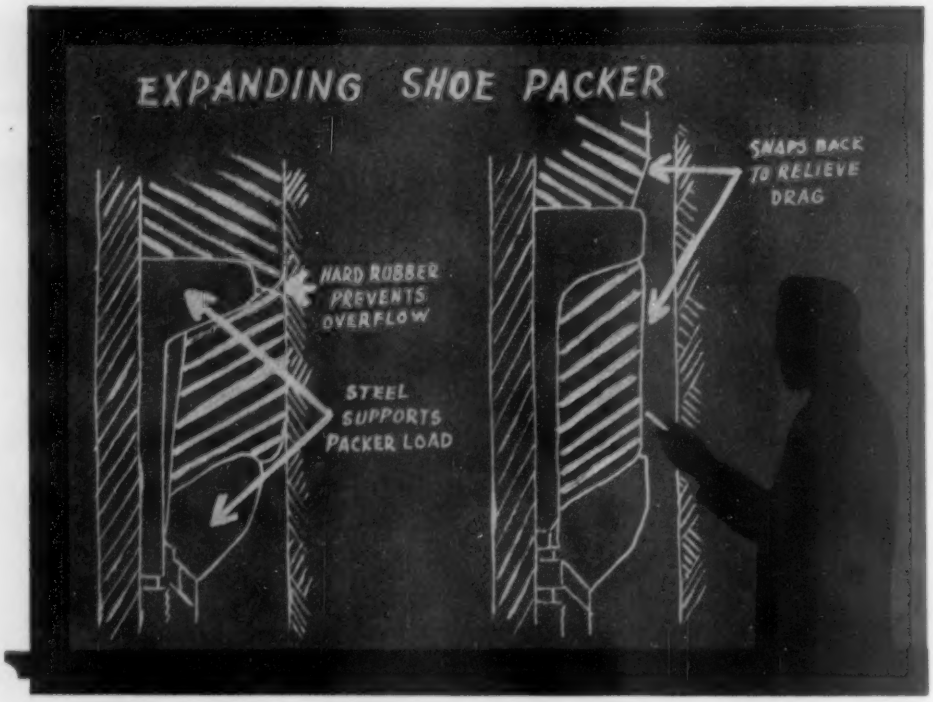

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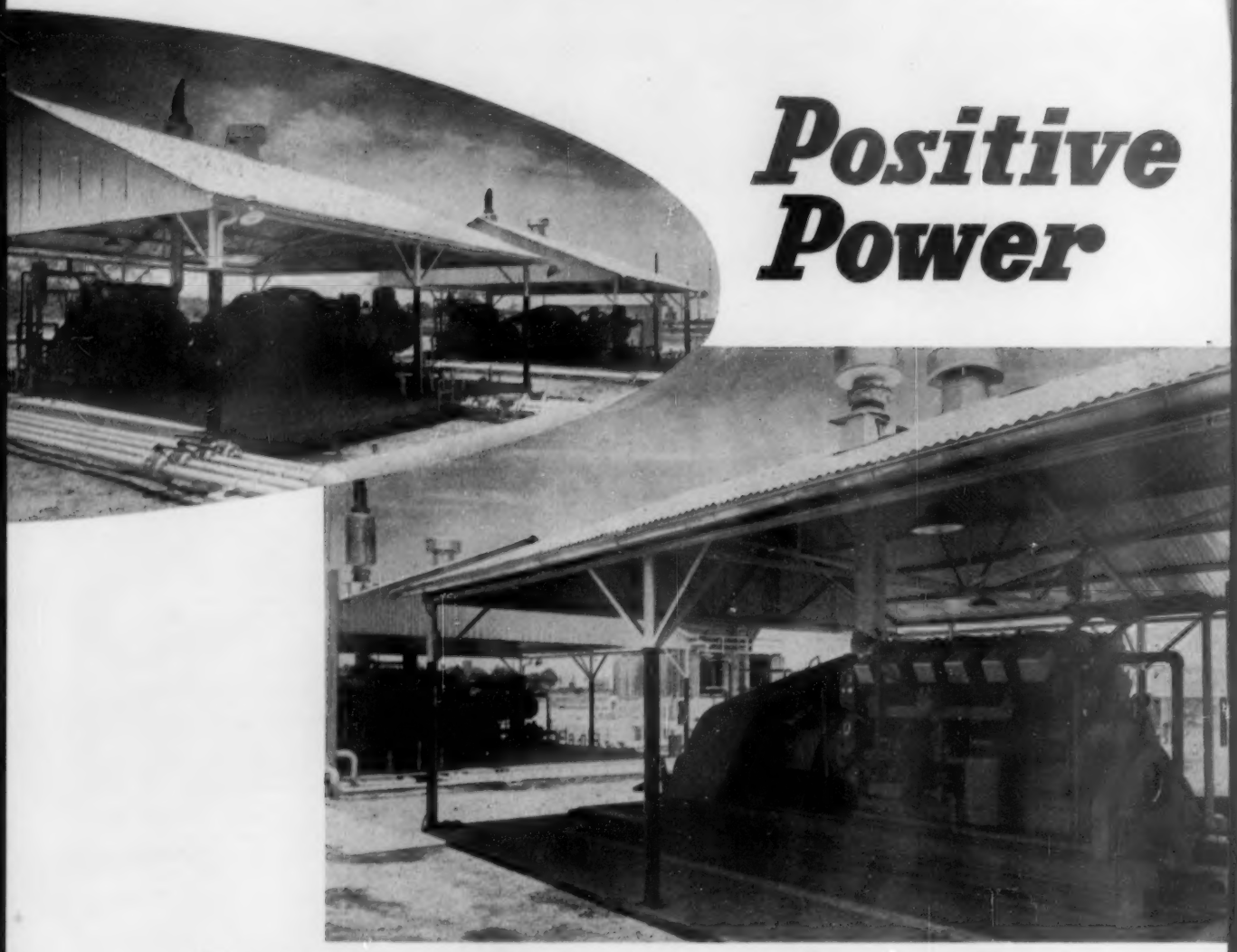

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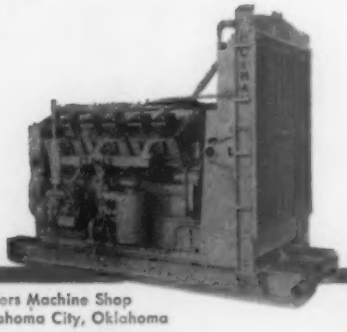

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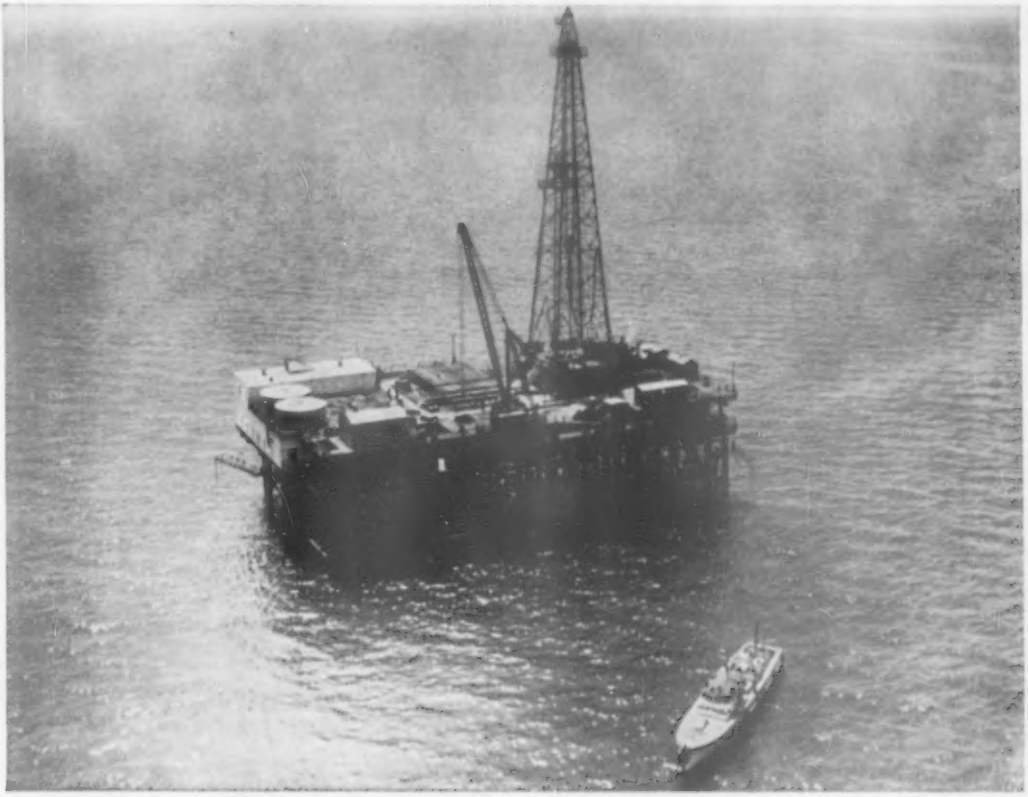

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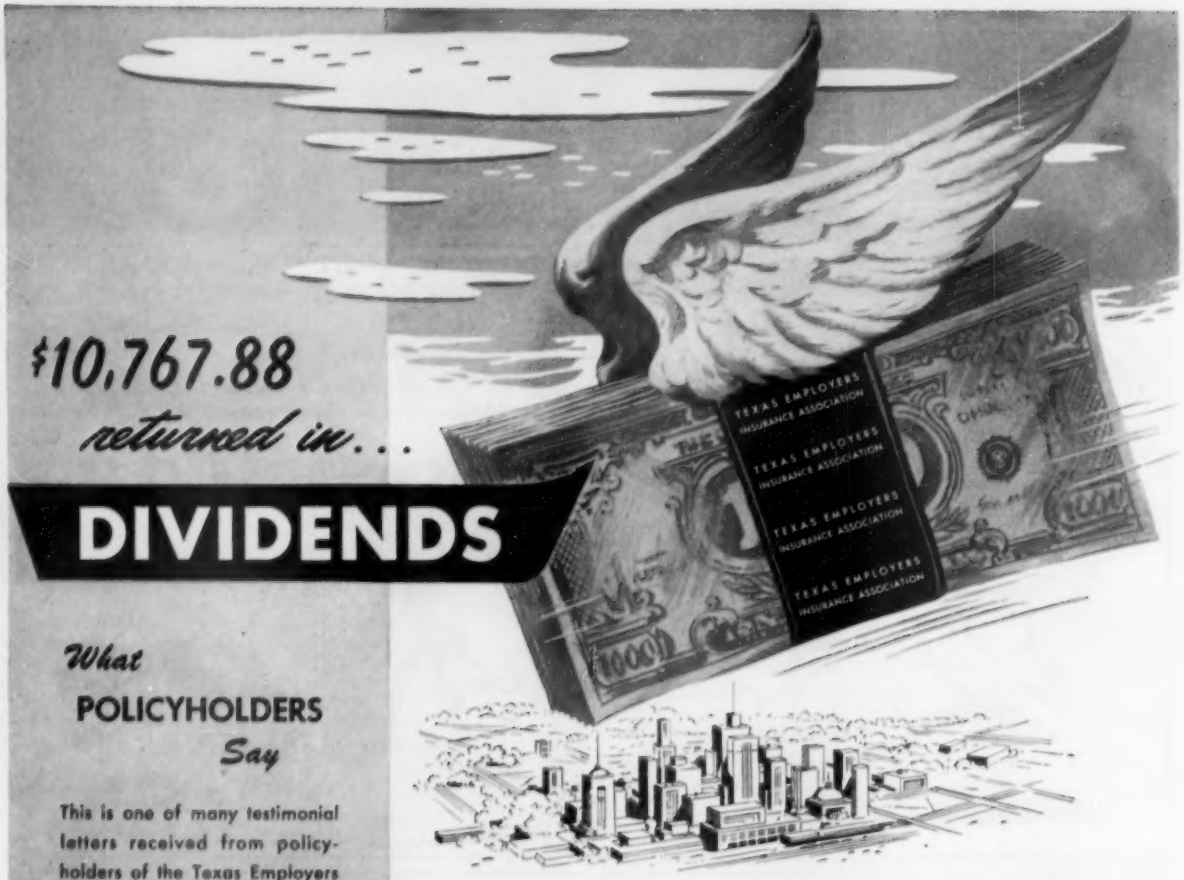
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Inhibitor response is closely tied to many variables. These include the nature of the crude, the character of the stock fed to cracking units, operating conditions, equipment performance —even employee carelessness.

Proper and economical use of inhibitors depends on quick adjustments to these changing conditions. On-the-spot service often is a "must."

As the producer of the Tenamene additives, Eastman is ready with that service whenever and wherever you need it. Highly qualified men are less than 24 hours away, ready to make your refinery their headquarters whenever a problem arises.

For more information on Tenamene additives and the interested technical service that backs up their proper use, contact our local representative or write to Eastman Chemical Products, Inc., Kingsport, Tennessee—a subsidiary of Eastman Kodak Company.

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tenn.; New York—260 Madison Ave.; Framingham, Mass.—65 Concord St.; Cincinnati—Carew Tower; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave.; St. Louis—Continental Bldg.; Houston—412 Main St. **West Coast: Wilson Meyer Co.;** San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S. W. Sixth Ave.; Seattle—821 Second Ave.

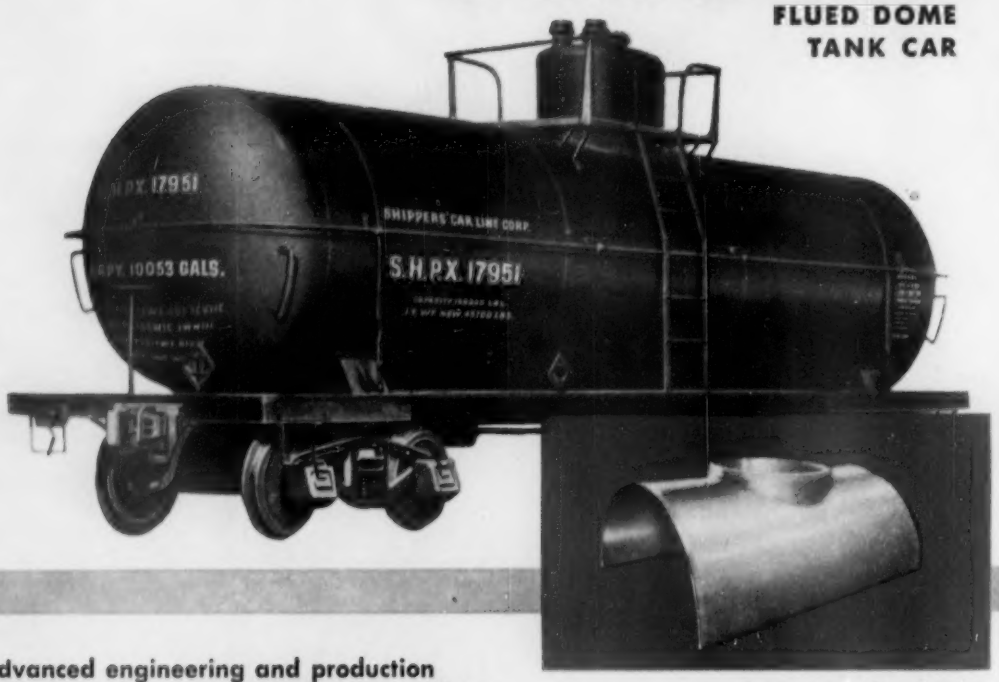
Tenamene

EASTMAN GASOLINE ADDITIVES

New concept in tank cars

acf BUILT **DURADOME**

FLUED DOME TANK CAR



Advanced engineering and production know-how make this truly modern tank car available at *no extra* cost.

Top center section, showing flued dome base

- A million-dollar press actually *flues* the dome base out of the heavy center section—providing greater strength and a smooth interior for easier cleaning . . . better application of lining.
- Superior *pressure-type* tank construction (complete ring sections) means heavier steel *all* the way around for greater durability.
- *Standardized* all-welded underframe provides flexibility of use with tanks of all standard types and capacities . . . more economical maintenance.
- *All-welded* insulation jacket (when insulation is required). Streamlined . . . more weatherproof . . . easier to keep clean . . . needs less maintenance.

The DURADOME car is available for lease or sale through . . .

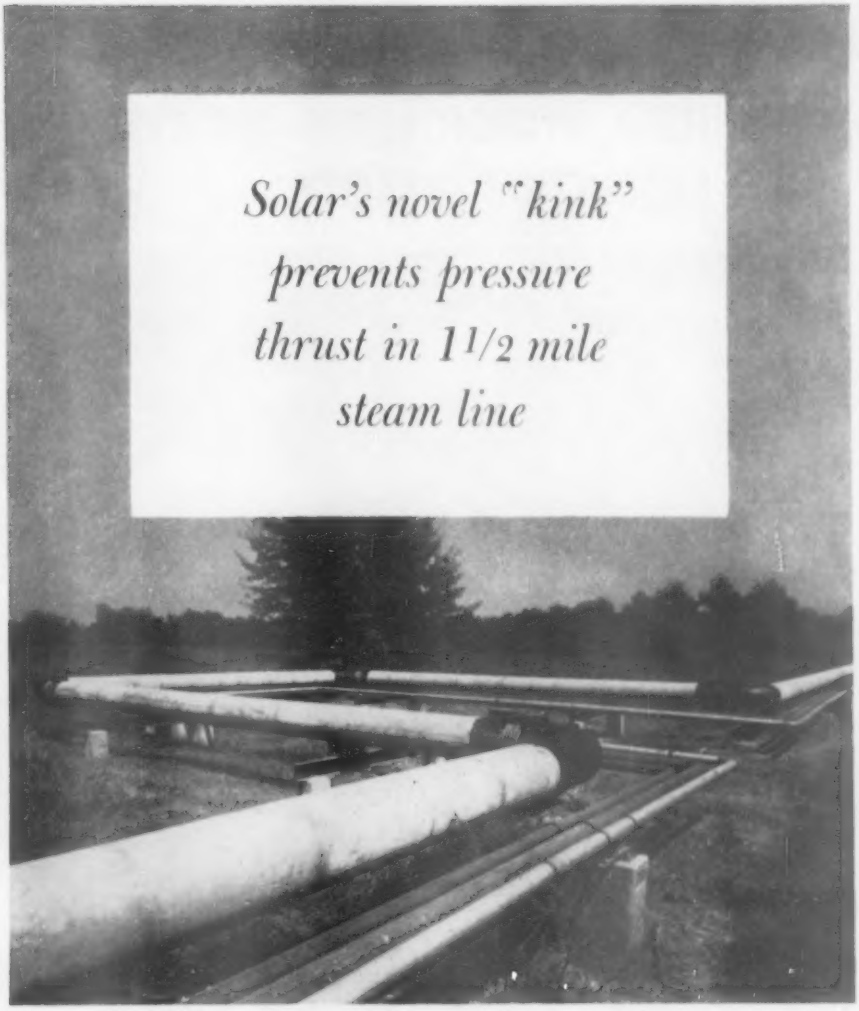
SHIPPERS' CAR LINE — SHPX

SHIPPERS' CAR LINE CORPORATION

30 Church Street, New York 7, N. Y.

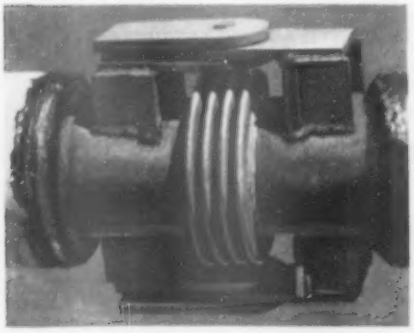
A subsidiary of acf INDUSTRIES Incorporated

CHICAGO, ILL. • HOUSTON, TEX. • SAN FRANCISCO, CAL. • MILTON, PA. • EAST ST. LOUIS, ILL. • SMACKOVER, ARK. • TULSA, OKLA. • NORTH KANSAS CITY, MO.



THIS HINGED EXPANSION LOOP was designed by Solar engineers to solve an unusual problem at Lion Oil Company's Barton Plant, in Luling, La. The steam line shown above runs more than 1½ miles, operates at 200 psi and a temperature of 560 F. The problem was to stop pressure thrust and accommodate a large amount of pipe expansion.

Hinged expansion joint



The expansion loop employs four Sola-Flex hinged bellows joints, each requiring only 4 degrees of angulation. Yet this hinged loop permits *nine feet of expansion*, thus accommodating the expansion of the entire 1½ mile steam line!

Experienced Solar engineering teams are always ready to help solve your high and low pressure piping problems. And Solar can follow through—with standard or custom-built expansion joints and convoluted couplings for all your piping needs. Send for Sola-Flex catalogs today.

SOLAR AIRCRAFT COMPANY
SAN DIEGO
DES MOINES

DESIGNERS DEVELOPERS AND MANUFACTURERS OF METAL ALLOY PRODUCTS

This is What Solar Offers You

Solar specializes in the manufacture of precision products from alloys and special metals for severe service. Solar's experience since 1927 is unduplicated in this field. Solar skills and facilities range from research, design and development through to mass production. Wherever heat, corrosion or difficult specifications are problems, Solar can help you solve them.

PLANTS. *In San Diego and Des Moines (photograph above). A total of 1,400,000 sq ft of floor space. Approximately 5,000 employees. Annual sales over $65,000,000.*

EQUIPMENT. *Production equipment for all types of metal fabrication—forming, machining, welding, brazing, casting, coating. Extensive laboratory and testing equipment. Facilities for development, prototype, limited or mass production.*

SERVICES. *Research, design, development, tooling and production engineering staffs. Experienced with all alloy steels, stainless alloys, super alloys, and titanium and its alloys. Government source inspection and Solar quality control meet rigid aircraft and commercial standards.*

CONTRACT PRODUCTION

Current orders include aircraft engine and airframe parts, alloy castings, pneumatic ducting, atomic energy components. Customers include some of the most honored names among aircraft and industrial companies in the U.S. and Europe.

SPECIAL PRODUCTS

Bellows. *"Sola-Flex"® bellows and expansion joints in many designs from ½ in. up to the world's largest, 28 ft in diameter.*

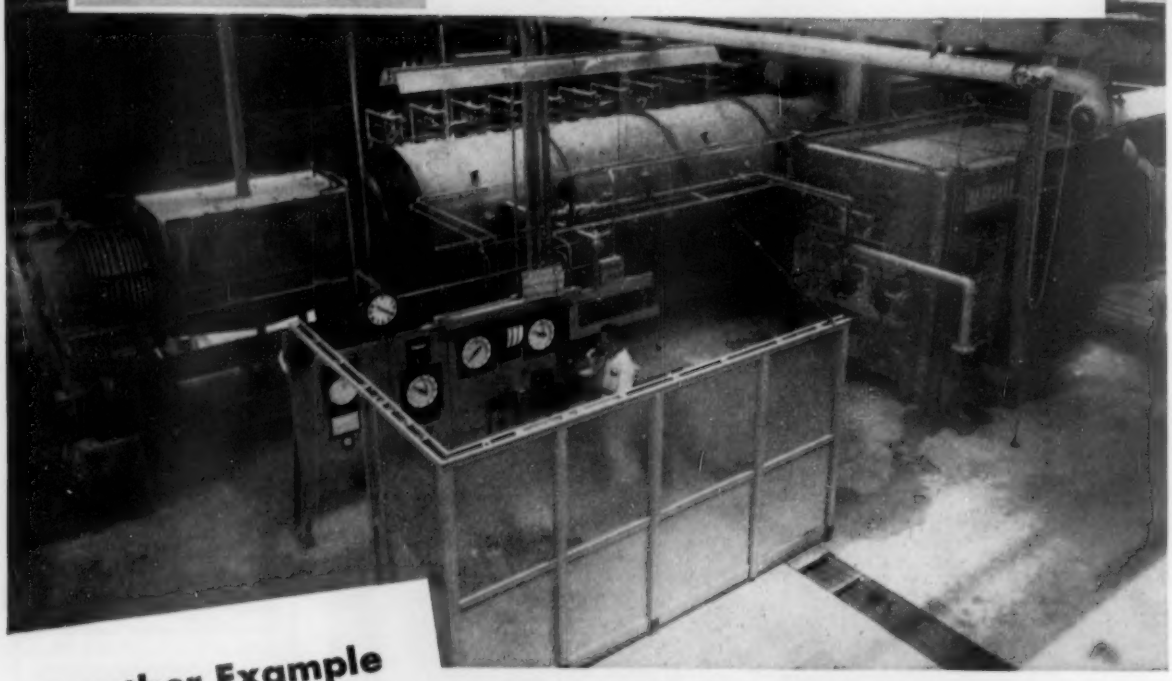
Gas Turbines. *Solar "Mars" 50 hp engines for auxiliary generator sets, ground carts, portable fire pumps; Solar "Jupiter" 500 hp engines in variable and constant speed models.*

Ceramic Coatings. *"Solaramic"® is the Solar trade mark for a family of coatings that protects metals from heat, corrosion, galling and abrasion.*

Controls. *Complete control systems utilizing the new Solar "Microjet"® principle for control of gas turbines, jet engines and pneumatic devices.*

FURTHER INFORMATION
Your inquiry regarding any Solar product or service will receive prompt attention. Address
Solar Aircraft Company
Department A-60
San Diego 12, California

Nalform FLUID HYDROFORMING CATALYST PRODUCTION CAPACITY . . .



another Example of Service to further Petroleum Industry Progress

● Fluid hydroforming to upgrade petroleum products is one of the typically rapid advances in the Petroleum Industry that the Nalco Catalyst Division is proud to have had a part in making possible.

Standard Oil Development Company and Nalco Catalyst Division worked together in developing Nalform Hydroforming Catalyst. In a surprisingly short time, Nalform was being produced in commercial quantities.

Nalform and Nalcat Catalysts are good examples of the abilities and facilities of Nalco Catalyst Division to produce and provide service to match petroleum industry progress.

Nalcat · Nalform

Production and Service to Match Petroleum Industry Progress

CATALYST DIVISION — NATIONAL ALUMINATE CORPORATION
4005 West 71st Street • Chicago 29, Illinois

"First in supply service" means

a million miles every month on the road!

Oil country miles are usually long ones, but every trip is just part of the day's job for the men in the National Blue cars. Working out of the National Supply Stores in their area, they know well the many roads they travel to regularly keep in touch with customers and promptly service their needs.

Every month, hundreds of National field service representatives average a total of more than a million miles on the road . . . over the sands of Texas, through mud in Illinois and snow in Calgary. Wherever you go in the oil country, you'll see them, giving special advice and help wherever and whenever it's needed.

Your continued satisfaction with their services, and the network of completely-stocked stores which they represent, keeps us the world's largest oil country supply organization. Being "first in supply service," as well as first in equipment quality, has been tradition for over half a century. The man in the National Blue car can tell you.

First in quality...
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

THE
NATIONAL SUPPLY
COMPANY
PITTSBURGH 30, PENNSYLVANIA

Why **NATIONAL PUMPING UNITS** can meet your most exacting needs...

More than 20,000 National Pumpers have been put into service to meet the most exacting needs of oil men everywhere. Here's why:

1. They are ruggedly built and precision-engineered

Jig-welded construction, reinforced at all points of extreme stress, assures ample strength. Precision engineering provides for positive alignment and interchangeability of all component parts.

2. They are easy to assemble and adjust

The simple, compact design of National Pumping Units makes possible easy field assembly. Every component section, from main base to walking beam, has adjustment features which guarantee true alignment to the well. Counterweights are designed for easy, safe adjustment by one man at ground level (see opposite page).

3. They cost less to operate and maintain

Needle type anti-friction saddle and pitman bearings, self-aligning wrist pin bearings and pressure relief valves to prevent over-lubrication are typical of the many quality features which provide for efficient, low-cost operation. Because National Pumpers are individually engineered to perform dependably under specific load requirements, they require a minimum amount of maintenance.

4. They are exceptionally long-lived

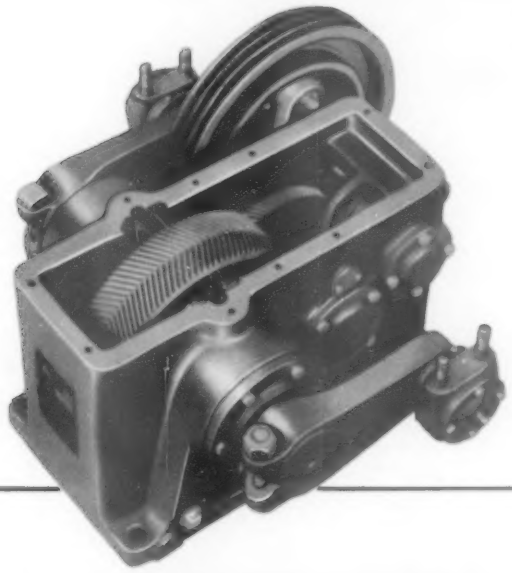
National Pumpers have an outstanding reputation for giving long, non-stop service under all conditions. The extra stamina built into them provides for smooth operation—even when depth ratings are exceeded.

5. There is a model to economically suit every load and field condition

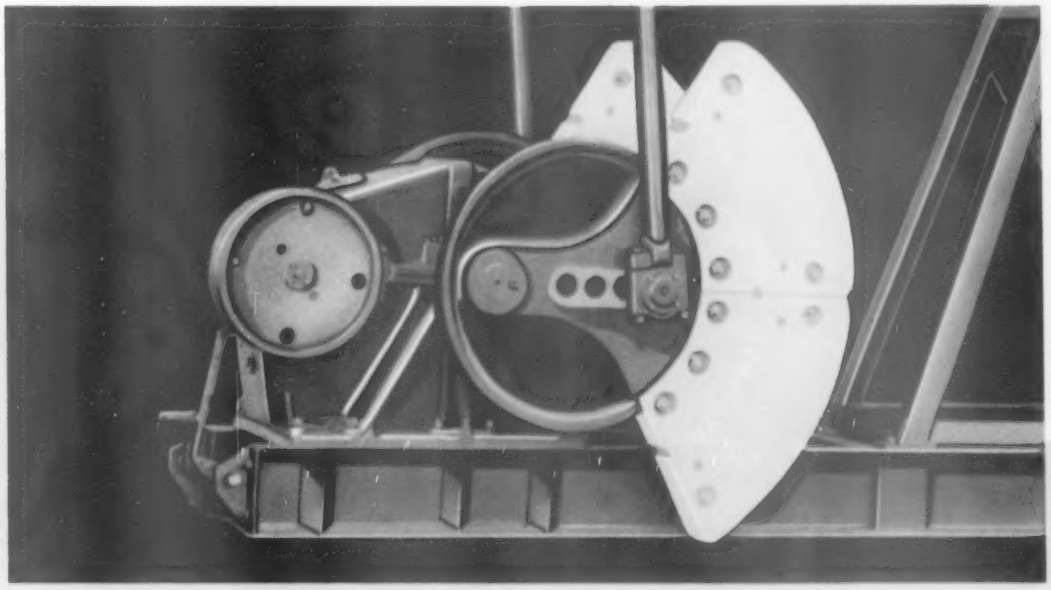
National's complete line of pumping units ranges from a 3,200 pound API rated walking beam unit to a 32,400 pound API rated walking beam model.

A total of **38 combinations,** in beam and crank counter weighted types, are available, and you can easily select the exact unit to best handle each job.

Facts and figures on the unit that's best for your well are readily obtainable from the National Supply Representative in your area. Why not let him show you how it pays to standardize on National Pumping Units.



National gear reducers, precision-built in single and double reduction types, are run-in under load at the factory to assure quiet and efficient operation in the field. All moving parts are cascade lubricated, and all extended shafts have weather-tight oil seals. Sediment chambers in gear cases can be quickly cleaned by means of easily accessible magnetic drain plugs.



Reduced power consumption and minimum stress on the unit and rods are made possible with National's patented eccentric type disc crank. With its rim-locked counterweights, it is safely and easily adjustable by one man at ground level. The weights slide around the track to any desired position, allowing the very maximum in accuracy of counterweight effect and degree of lag and lead.

First in quality...
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

DIVISION OFFICES: Dallas, Ft. Worth, Houston, Toledo, Tulsa, Torrance

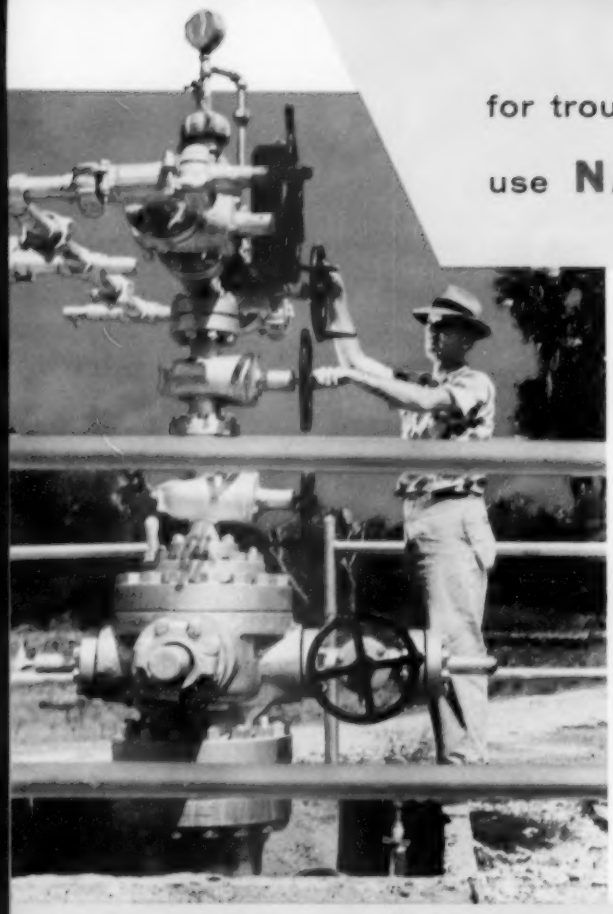
CANADA: The National Supply Company, Ltd., 200 9 W. Chun 3 Bldg., 209 Eighth Avenue, West, Calgary, Alberta

EXPORT: 60 E 42nd Street, New York 17, N. Y., U.S.A.; Dorland House, 13 Suffolk Place, London S. W. 1

for more information on profitable production, see the next page

for trouble-free recovery by any method,

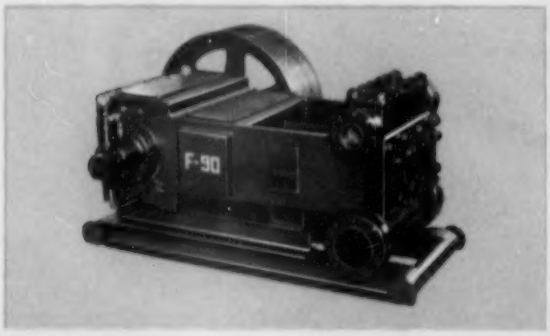
use **NATIONAL** PRODUCTION EQUIPMENT



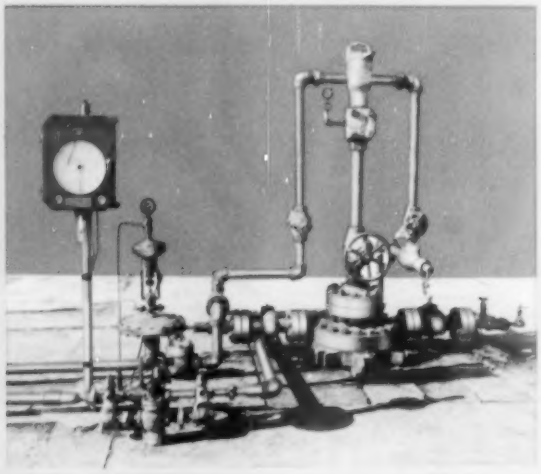
You'll find it worthwhile to get *all* the facts on National Production Equipment for primary and secondary operations. You can get product bulletins and any other information you may require at the nearby National Supply Store.

NATIONAL SUCKER RODS are precision-manufactured in various grades to meet every load and well condition. They are engineered for maximum resistance to shock, corrosion, fatigue and impulse loads.

NATIONAL WELLHEAD EQUIPMENT has interchangeable units which provide a multitude of combinations to meet your specific needs in size, capacity and type. Ease of assembly and pre-tested safety are two more outstanding features of this equipment.



NATIONAL TRIPLEX PUMPS provide maximum volume and injection pressures for today's waterflood projects. Available in several h.p. ratings, they are also usable for salt water disposal, oil gathering, or as power-oil sources for sub-surface hydraulic pumping.



NATIONAL'S IDEAL PLUNGER LIFT uses formation pressure for economically producing wells where reservoir conditions are suitable. For these certain types of wells, Ideal Plunger Lift can be the best production method to use.

First in quality...
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

THE **NATIONAL SUPPLY** COMPANY

PITTSBURGH 30, PENNSYLVANIA

DIVISION OFFICES: Denver, Ft. Worth, Houston, Toledo, Tulsa, Torrance

CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta.

EXPORT: 600 Fifth Avenue, New York 20, N. Y., U.S.A.; River Plate House, 12 South Place, London E. C. 2

YOU'LL GET BETTER TEAMWORK...

With a CABOT

Cabot units are strong and simple. There is little cause for poor balance. One man can adjust the cranks in a few minutes.

The bearing between the pitmans and the walking beam is typical of Cabot ingenuity. It is rubber, and patented. Lubrication, awkward at this point, is no longer needed, as there are no moving parts. It absorbs vibration and smooths off the peaks of the polish rod load.

Even the rods and pump seem to work more willingly on a Cabot-equipped well.

You'll get better teamwork with a Cabot.

Ask any J&L man for a bulletin on these Cabot Pump Units plus numerous other smaller sizes and types, or write us at Tulsa, P. O. Drawer 2481.

Cabot Type AC (Adjustable Crank) Units have structure capacities from 9,000 to 32,000 pounds maximum polish rod load. Reducers have Sykes-cut herringbone gears rated from 40,000 to 456,000 inch pounds. All are rated to API standards. Derrick-type samson posts are made of heavy angles with well-designed bracing members, boxed in at the top with steel plates. Floor clearing bases, Vee belts, belt guards, reducer oil, and adjustable slide rails are standard equipment. Oil slingers and labyrinth grooving are used on the reducer shafts eliminating oil seals.

J&L STEEL

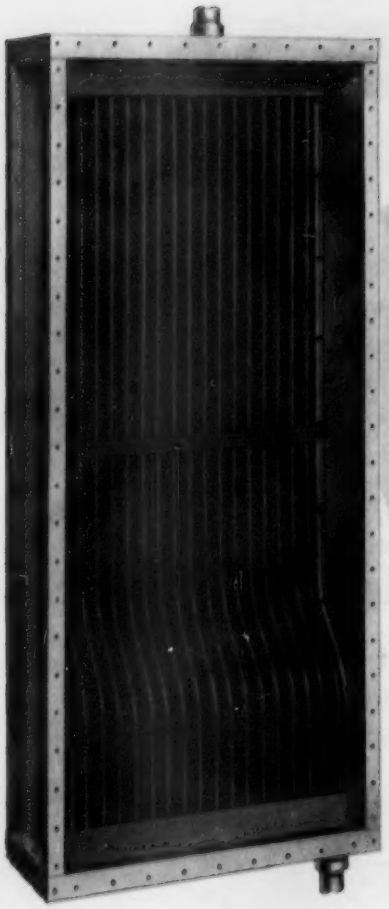
Jones & Laughlin STEEL CORPORATION

SUPPLY DIVISION — TULSA, OKLAHOMA

Serving The United States and Canada

103-M

EFFICIENT *Extended-Surface* HEAT EXCHANGERS



for

Heating
Cooling
Process
Air Conditioning

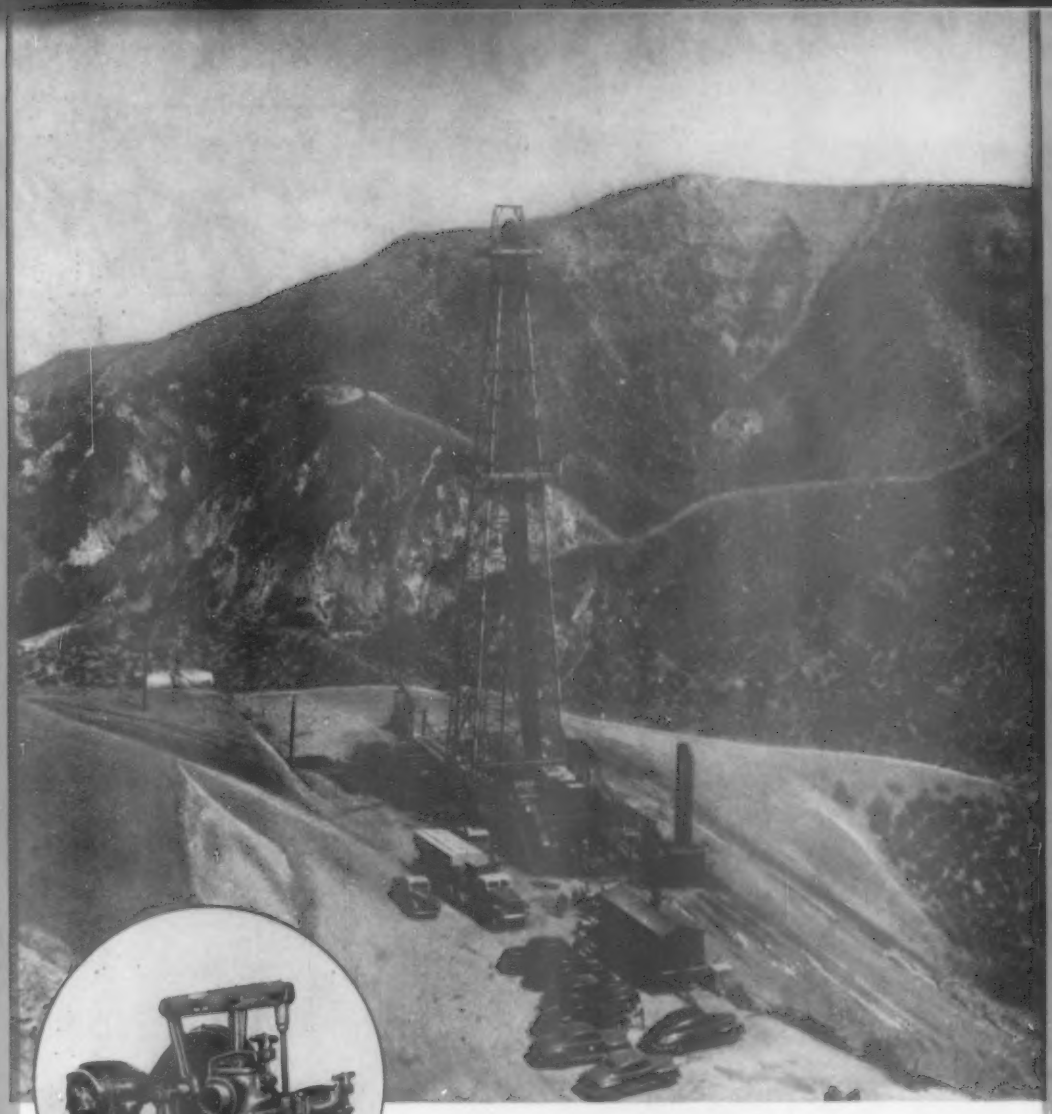
ASK THE AEROFIN MAN

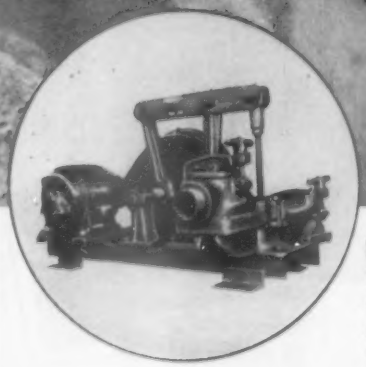
Your Aerofin man's recommendation means high efficiency, long service life, low maintenance costs.

Aerofin's unequalled laboratory and manufacturing facilities — unequalled knowledge of heat-exchange practice — are devoted exclusively to the design and manufacture of highest quality extended heat surface.

Aerofin is sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION
101 Greenway Ave., Syracuse 1, N. Y.





Rugged equipment for rugged country—no matter where the oil is, you'll find dependable Marlow Self-Priming Centrifugal Pumps around the drilling rig. Operators use these job-engineered pumps for rig washdown, brake cooling water, utility water supply and many other applications.

marlows are durable!

Built especially for oil country use, Marlow Self-Priming Pumps and Marlow "Mud Hogs" make a team that can't be beat. Marlows are "old hands" at oil country pumping. They've proved their durability for majors and independents alike on round-the-clock, trouble-free service. That's why more and more veteran oil men are making Marlows first choice. Make sure with Marlow . . . see your Marlow dealer or write for Bulletin O-53.

MARLOW PUMPS • RIDGEWOOD, NEW JERSEY

Division of BELL & GOSSETT COMPANY

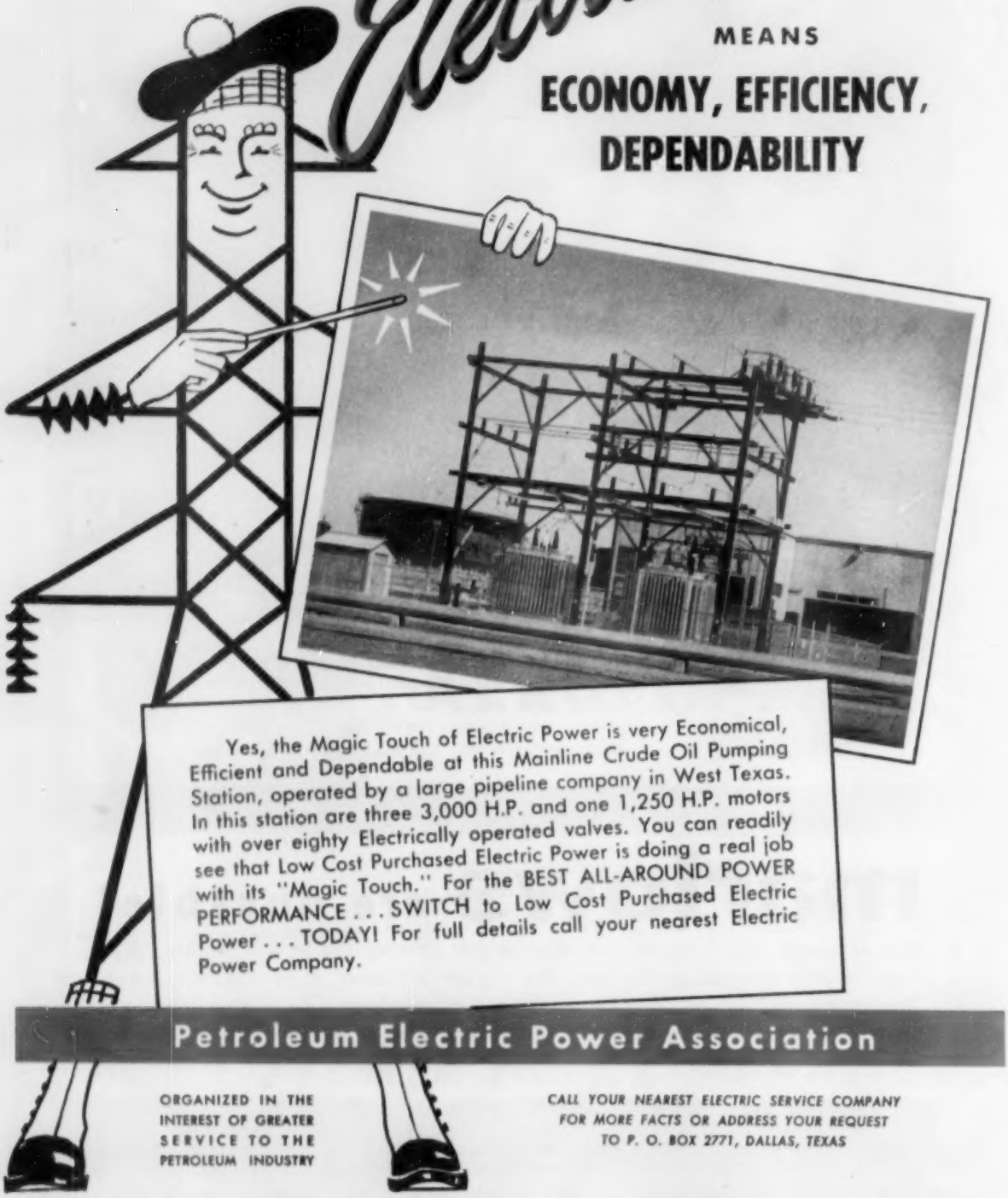
630

The Magic Touch of

Electric Power

MEANS

ECONOMY, EFFICIENCY, DEPENDABILITY



Yes, the Magic Touch of Electric Power is very Economical, Efficient and Dependable at this Mainline Crude Oil Pumping Station, operated by a large pipeline company in West Texas. In this station are three 3,000 H.P. and one 1,250 H.P. motors with over eighty Electrically operated valves. You can readily see that Low Cost Purchased Electric Power is doing a real job with its "Magic Touch." For the BEST ALL-AROUND POWER PERFORMANCE . . . SWITCH to Low Cost Purchased Electric Power . . . TODAY! For full details call your nearest Electric Power Company.

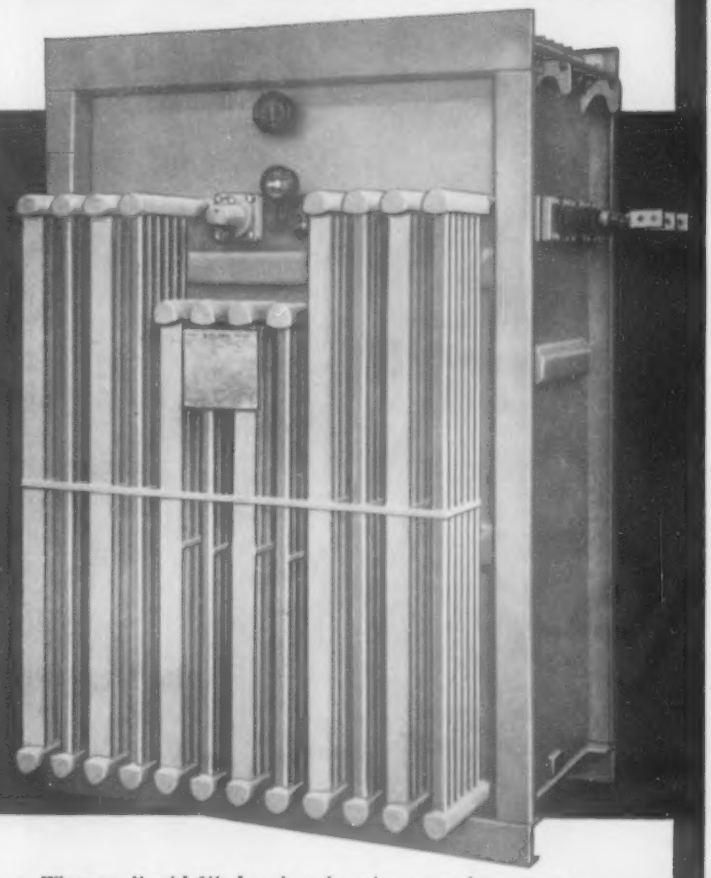
Petroleum Electric Power Association

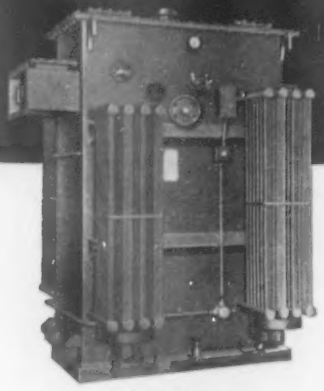
ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

CALL YOUR NEAREST ELECTRIC SERVICE COMPANY FOR MORE FACTS OR ADDRESS YOUR REQUEST TO P. O. BOX 2771, DALLAS, TEXAS

Wagner®
TRANSFORMERS
...the choice of leaders in industry

for space-saving load centers... specify Wagner Close-Coupled Unit Substation Transformers





Wagner

THROAT-CONNECTED UNIT SUBSTATION TRANSFORMERS

For outdoor installation, or for applications where it is desirable to locate the transformer away from the switchgear, Wagner can furnish these liquid-filled transformers in ratings to 2000 kva, 15 kv and below. Bulletin TU-13 gives full information.

Now, Wagner liquid-filled unit substation transformers are available in new, improved close-coupled units, rated from 300 to 2000 kva, that can be flush-mounted with any make of switchgear. They can be used in both single and double-ended unit substations to form neat, compact, streamlined substations for modern industrial service.

Bushings are provided on the ends of the close-coupled transformer for connection to the switchgear. The bushing heights are designed for a minimum distance from the base, giving ample room to make connection to switchgear or busses in the switchgear compartment or transition section.

In this type design it is not necessary to coordinate bushing height of transformer and switchgear as in the throat connected units which often require special throat heights to match special switchgear. This feature means that a standard transformer can be used for special switchgear application with a minimum of engineering coordination, resulting in shorter deliveries.

Look to Wagner for better transformers that assure a continuous, dependable flow of power. Your nearby Wagner engineer will be glad to help you solve your load-center problems. Call the nearest of our 32 branch offices, or write us.

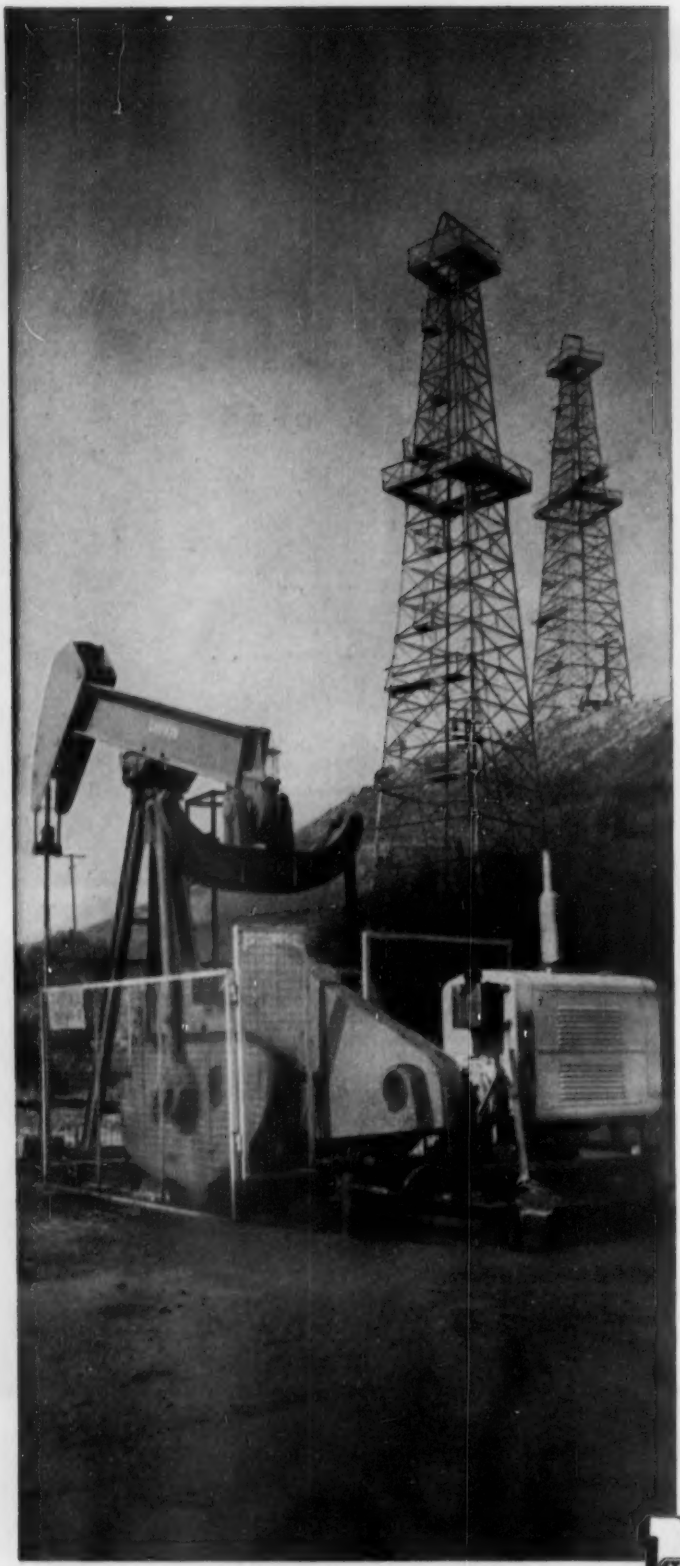
Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6389 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

T55-2



how long-run advantages work for you...

When you power beam pumps, circulation systems, Triplex, lease or field injection pumps with Minneapolis-Moline Oilfield Engines, you save service hours never believed possible . . . actually change service dates from days to many months.

Equipped with exclusive long-run advantages such as the MM water-jacketed base pan which maintains oil at a determined constant temperature regardless of weather or load conditions, massive MM parts and larger bearing surfaces, vacuum crankcase ventilation, water by-pass cooling . . . built-in oil-flow controllers . . . sealed pressure cooling . . . all backed by MM's strict quality control . . . you get *lowest cost* production power per h.p. hour.

For complete facts and specifications, contact your Minneapolis-Moline oilfield distributor. Let him show you why you're *ahead* with MM power.

MINNEAPOLIS-MOLINE
MINNEAPOLIS 1, MINNESOTA

DISTRIBUTED BY
SHRIMPTON
MANUFACTURING & SUPPLY CO.

LOS ANGELES
Tel. RAymond 3-6549

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ODESSA
Tel. 7-4088

never too far

from CF&I

SEAMLESS

CASING

and TUBING

NO MATTER where the rig may be located in Western oil country, it's always within prompt and economical reach . . . by rail or truck . . . of the CF&I Seamless Tube mill at Pueblo, Colorado.

Need for this "localized" source of supply for casing and tubing was the motivating force that brought into existence this great new mill—incorporating fabricating facilities that are up-to-the-minute; testing and inspection techniques that are unrivalled in the industry.

We'd like to have you see for yourself. Next time you're out this way, we'll be happy to take you through the plant and show you why we're so proud of our modern seamless tube mill.

CF&I Seamless Oil Country Casing and Tubing are available in sizes from 2⅜" O.D. through 9⅝" O.D.— meet API STD 5A specification.

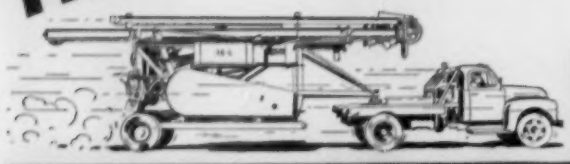
CF&I TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION
DENVER, COLORADO

CF&I

2672

Here's Speed That Pays Off



in Lower Per-Foot Costs

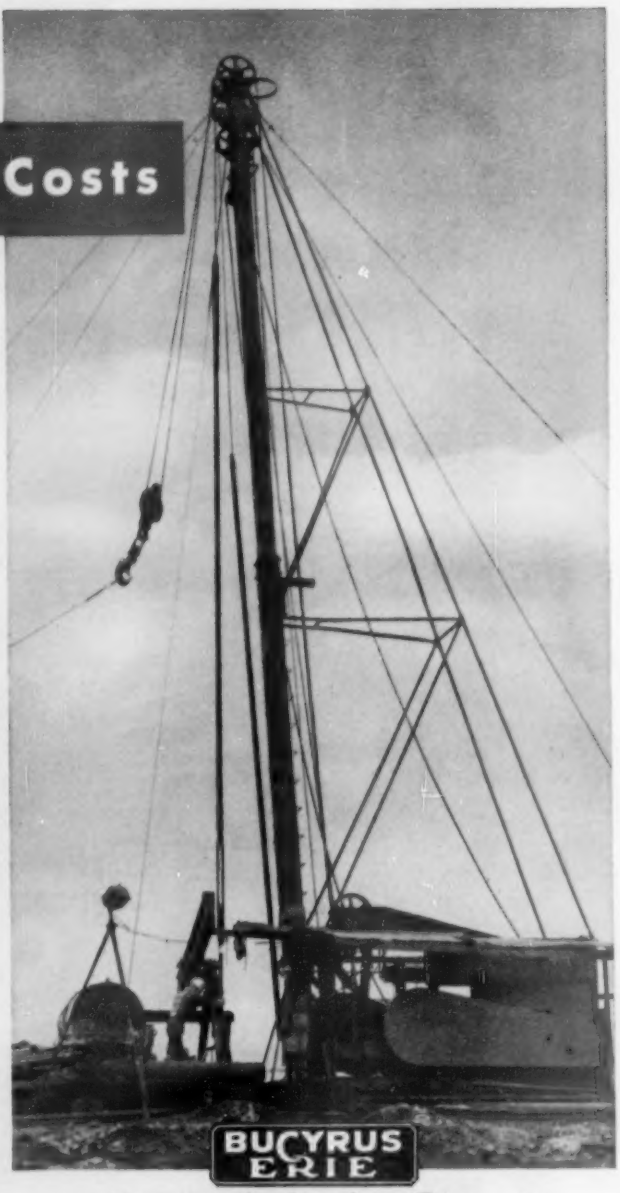
One reason why there are more Bucyrus-Erie spudders in use today than any other make is that they do everything with the speed you need for profitable operation.

With mobile mountings — semi-trailer, skid, or tandem axle* — you waste no time in moving these rigs (all in one compact unit) from one location to another. You get the jump on every job!

Quick set-ups and knock-downs increase production, too, because you get more actual drilling time on each job as a result. All-steel telescoping derricks are power raised; folding tubular braces move easily into place; the entire set-up operation takes as little as two or three hours, even with the largest machine.

And you can't beat the speed with which Bucyrus-Eries put down hole. Snappy spudding action, with shock absorber that can be blocked out for deep drilling, means real drilling speed even in tough formations. Forward and reverse speeds on all reels provide accurate, split-second control. Reels are freewheeling for lowering.

Bucyrus-Erie spudders are sold by exclusive distributors in all principal oil fields. Four models: 48-L swings 6,000 lb. tools, drills to 6,000 ft.; 36-L handles 4,200 lb. tools, drills to 3,500 ft.; 28-L swings 3,000 lb. tools, drills to 2,500 ft.; 60-L tool rating 2,750 lb., depth 1,500 ft. See your distributor for full details. 9554C



First With the Finest in Spudders

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin

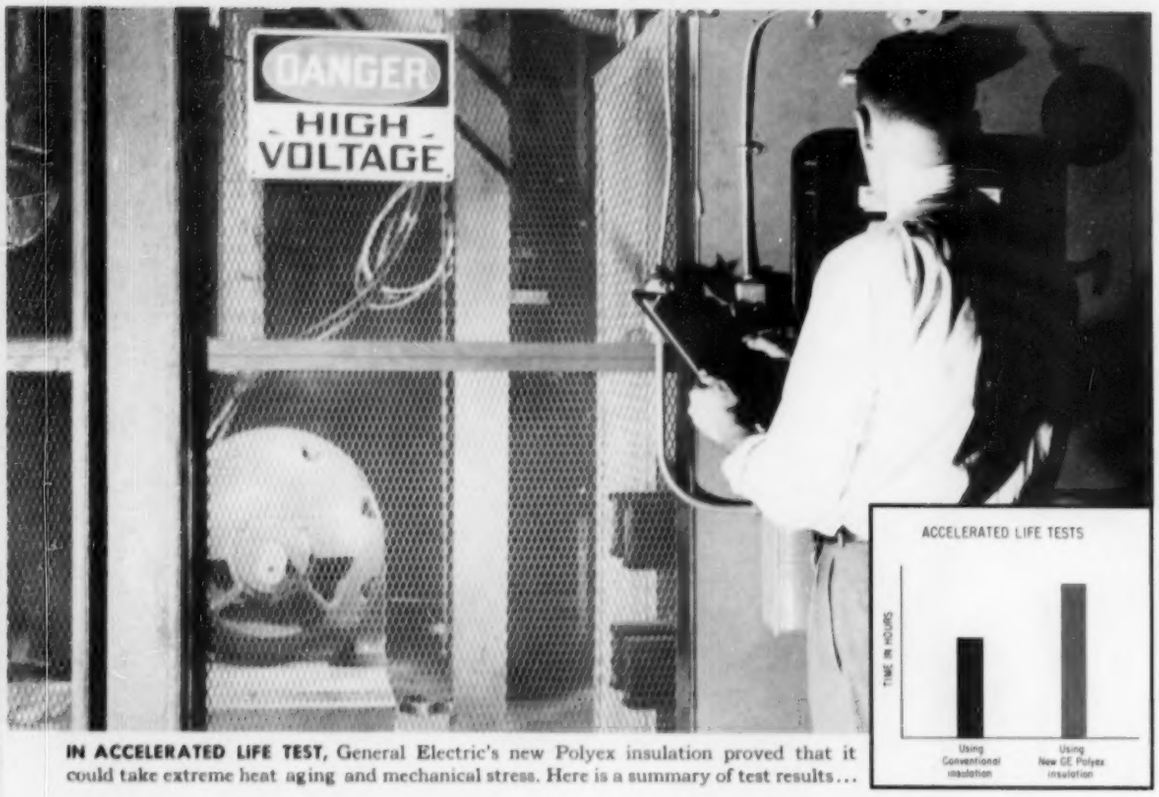
* Standard mounting for 48-L; optional at extra cost for 36-L. Not available for 28-L or 60-L.

HIGH-POTENTIAL TESTS HELP PROVE . . .

NEW INSULATION MAKES G-E MOTORS LAST 50% LONGER

See Details Inside

50% LONGER MOTOR LIFE



IN ACCELERATED LIFE TEST, General Electric's new Polyex insulation proved that it could take extreme heat aging and mechanical stress. Here is a summary of test results...

An engineering achievemen

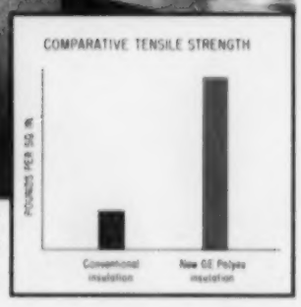
General Ele
That is 7

REVOLUTIONARY *POLYEX* INSUL
OF THE AMAZING PROPERTIES OF N

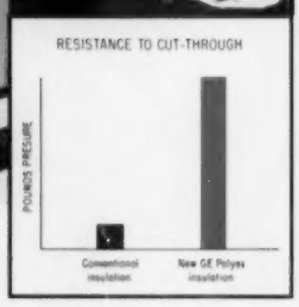
General Electric has developed a completely new Class A insulation for form-wound coils which lasts 50% longer than other insulations in use today. Its greater ability to withstand physical and thermal stresses provides an added margin of protection that will mean tremendous savings to you because of reduced motor failures and maintenance costs.

POLYEX INSULATION is a balanced system of polyester films and fibres, together with new hydrocarbon resins. Materials in new Polyex insulation have high dielectric and physical

7 TIMES GREATER PHYSICAL STRENGTH

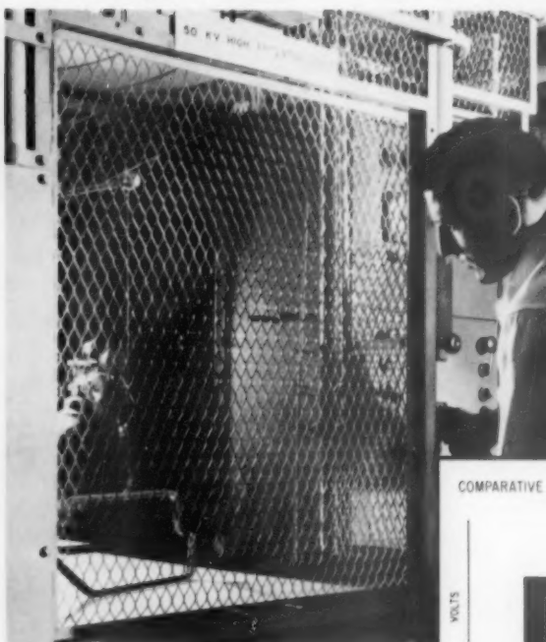


TENSILE STRENGTH of new insulation offers a greater protection against physical stress.



CUT-THROUGH STRENGTH, seven times greater than conventional insulation, is another reason for long life.

50% MORE DIELECTRIC



INITIAL DIELECTRIC STRENGTH TEST measures insulation's ability to withstand operating and starting voltages, and the protection offered against insulation failure.

...ement of vital importance to users of motors with form-wound coils . . .

...Electric Develops New Insulation for Motors ... 7 Times Tougher, Adds 50% to Motor Life

...Y INSULATION TAKES FULL ADVANTAGE ...ES OF NEW POLYESTER FILMS AND FIBRES

...pletely ...d coils ...tions in ...d phys- ... added ...endous ...failures

...stem of ...th new ... Polyex ...hysical

strength. For the first time, the cotton and paper-based tapes and sheets in conventional insulations have been eliminated.

RESULTS OF EXHAUSTIVE TESTS on new Polyex insulation are summarized on these pages.

Insulation qualities like these offer you tremendous savings in motor maintenance and a greater degree of service continuity than ever before possible.

GENERAL ELECTRIC RESEARCH for better insulation is a continuing program. Polyex insulation is the latest result of that program. Three years of intensive development and testing of materials and manufacturing techniques culminated in the most significant advance in large motor insulation in 45 years.

POLYEX INSULATION IS NOW AVAILABLE in many ratings of General Electric induction motors in the range of 100 to 3000 HP—and at no extra cost.

YOUR G-E SALES REPRESENTATIVE has complete information. Contact him at your nearby General Electric Apparatus Sales Office. *General Electric Company, Schenectady 5, New York.*

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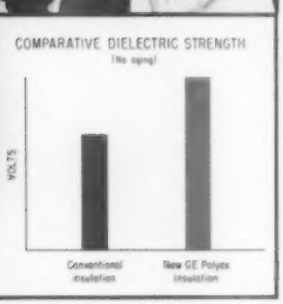
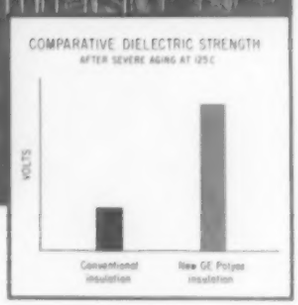
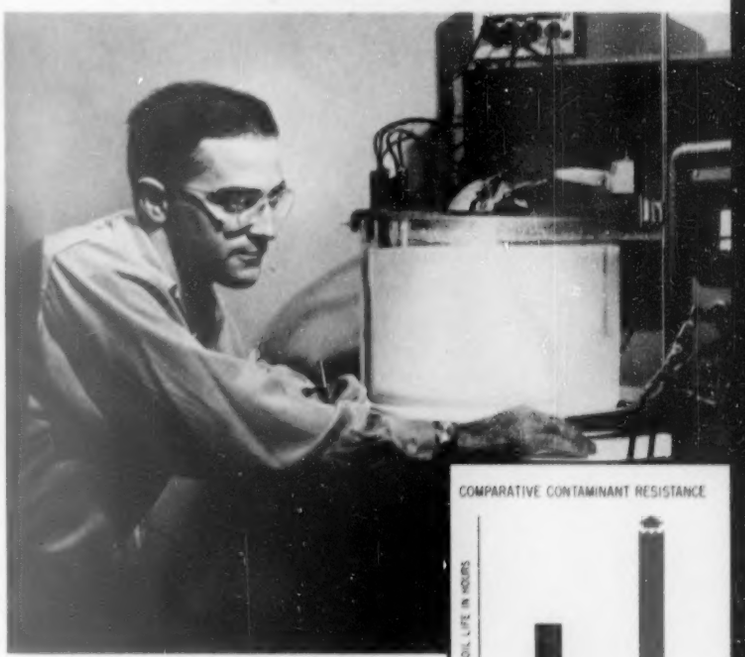
...CTRIC STRENGTH, EVEN AFTER HEAT AGING



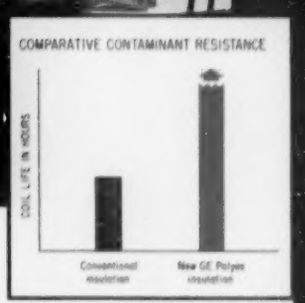
BAKED FOR THOUSANDS OF HOURS at 125°C, Polyex insulation was tested again. It proved that it retains its higher physical and dielectric properties after heat aging.



CONTAMINANT RESISTANCE DOUBLED

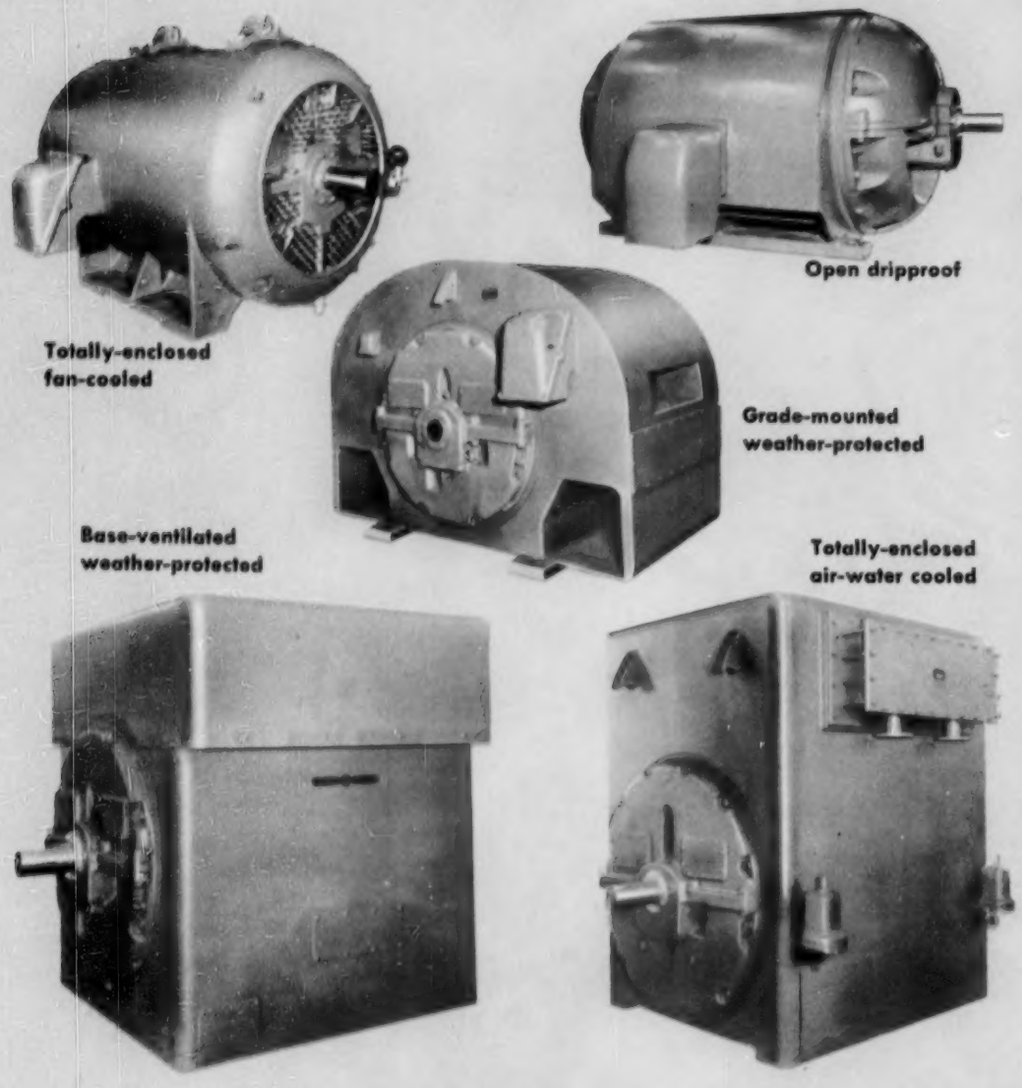


IN SALT SOLUTION, insulation's ability to resist contaminants was tested. Polyex-insulated coils were still operating long after conventional coils had failed.



NOW AVAILABLE IN MANY RATINGS OF THESE G-E INDUCTION MOTORS

(Approximately 100 to 3000 hp)



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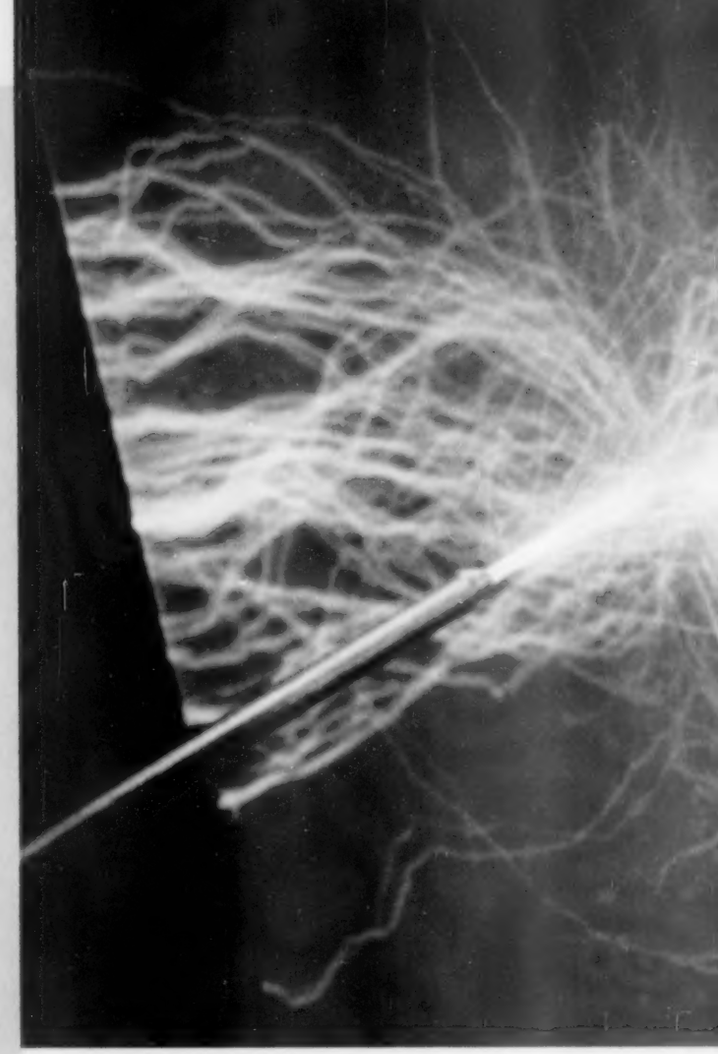
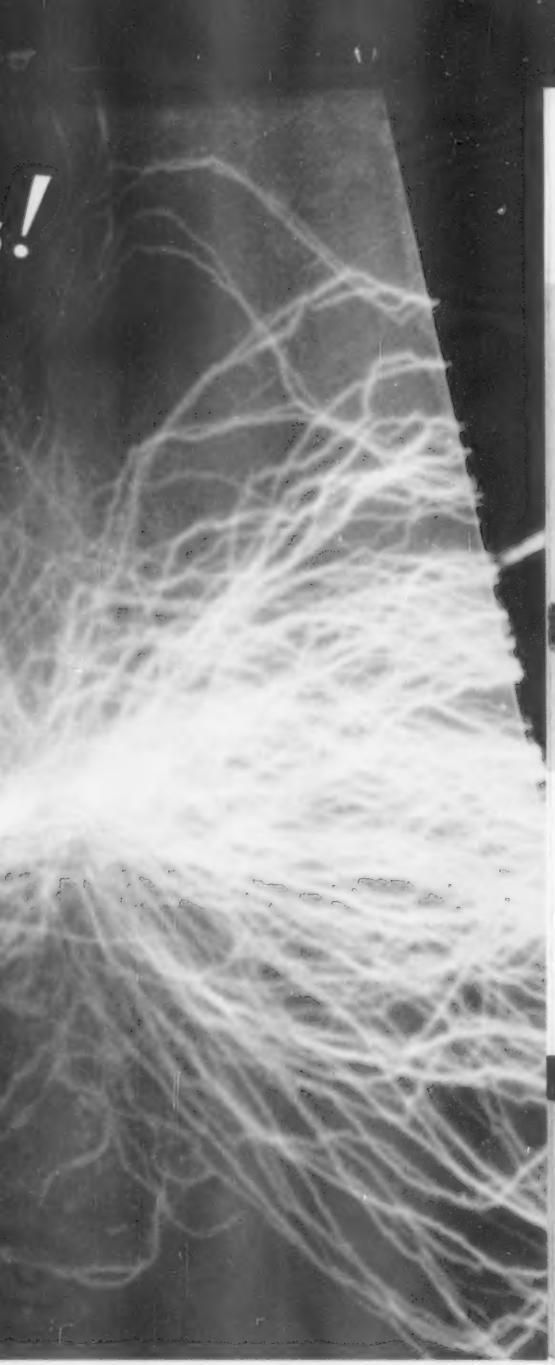
This is Progress!



HIGH-POTENTIAL TESTS HELP PROV

NEW INSULATION
MOTORS LAST 50

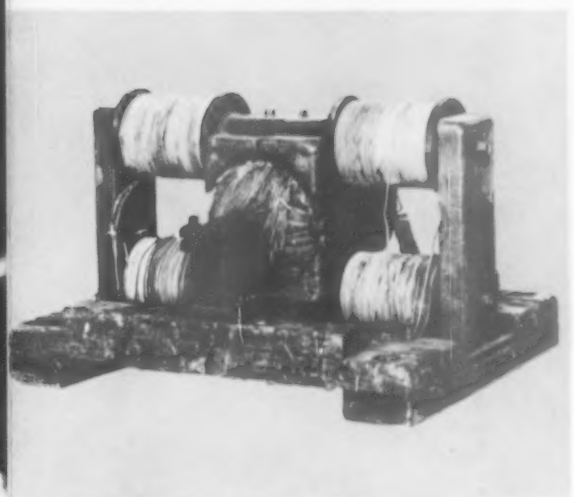
See Details Inside



PROVE . . .

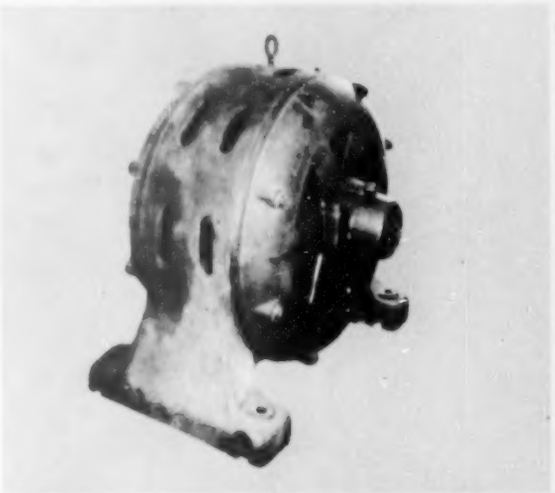
ON MAKES G-E 50% LONGER

THE THIRD MAJOR STEP IN THE EVOLUTION OF FORM-WOUND MOTOR INSULATION SYSTEMS



1878—FORM 1 INSULATION SYSTEM

Air was the insulator in early motor coils. Cotton was wrapped around the coils, but served only as a spacer to provide an air gap. The cotton wrapping itself was worthless as an insulator.

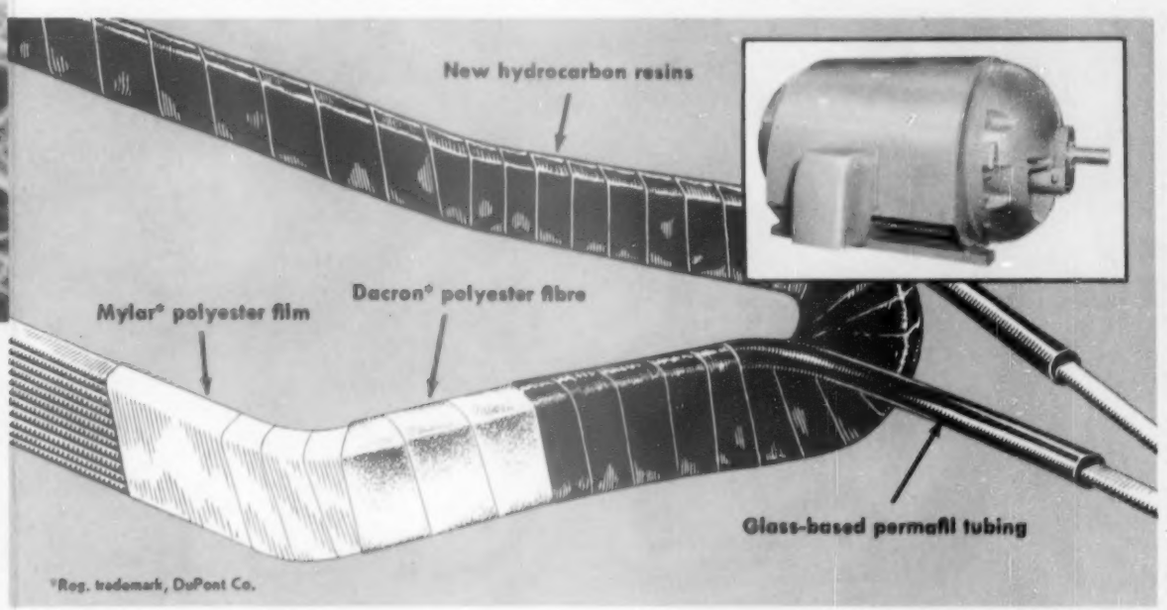


1910—FORM 2 INSULATION SYSTEMS ESTABLISHED

Linseed oil was added to cotton to provide insulating qualities. Since then, varnish and other insulating materials have replaced oil, but until now the basic concept has remained the same.

1954—G.E. INTRODUCES FIRST FORM 3 INSULATION SYSTEM

New G-E Polyex insulation becomes the first Form 3 insulation system. Made of polyester films and fibres, Polyex is the first insulation in which the materials have natural insulating qualities of their own.



*Reg. trademark, DuPont Co.

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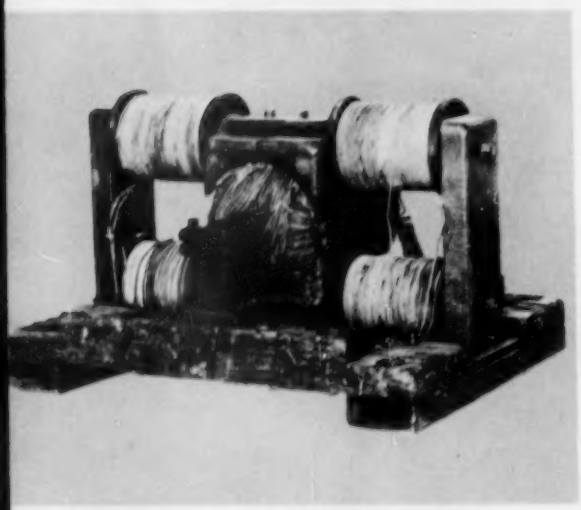
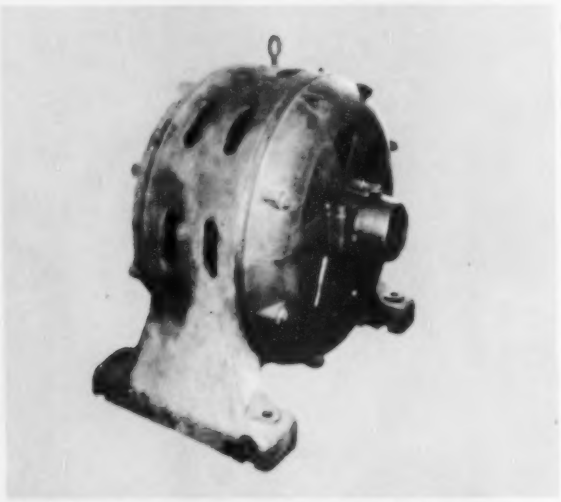
THE THIRD MAJOR STEP IN THE EVOLUTION OF FORM-WOUND MOTOR INSULATION SYSTEMS





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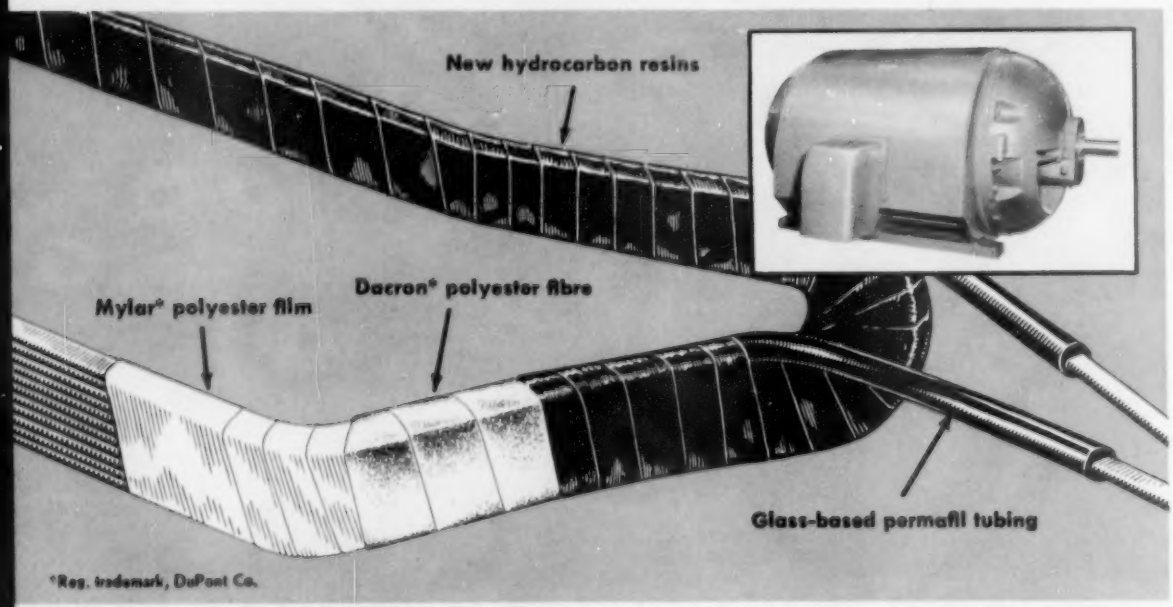

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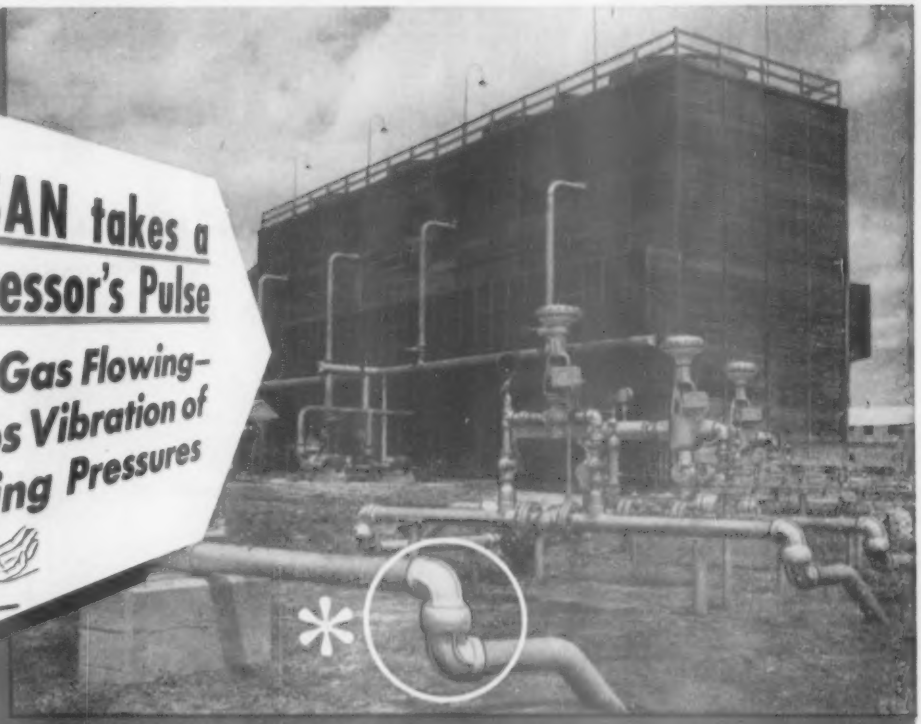
CHIKSAN takes a Compressor's Pulse

Keeps Gas Flowing—Absorbs Vibration of Changing Pressures



NOT only do the stamina and flexibility of Chiksan Joints take expansion in their stride, they absorb pulsation and vibration.

When the Plymouth Oil Company wanted a better way to handle the expansion and contraction of its 2500-3500 lb. natural gas re-pressuring line in its compressor station in Sinton, Texas, back in 1946, it tried Chiksan 2-inch high pressure ball bearing swivel joints. So successful were Chiksan Joints in this application, they were adopted for 3 and 4-inch lines for the same purpose. In addition, by placing regulators, gauges and other recording equipment on a bridge using Chiksan Joints, accurate readings of the instruments could be obtained.

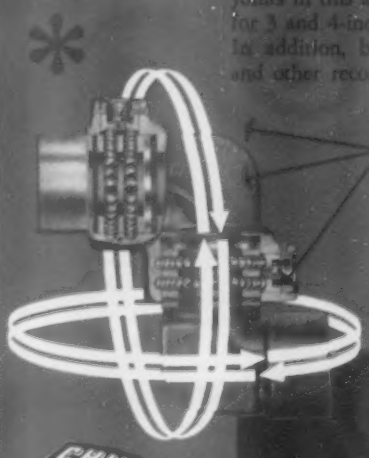
Since 1946, not one of these Chiksan Joints has been replaced or even repacked, and they are giving the same economical, dependable service they did when first installed.

In Texas or California — all over America and all around the world — wherever production, processing or distribution depends on the flow of liquid or gas or on the dependability of hydraulic systems, there you will find Chiksan Ball Bearing Swivel Joints on the job — adding muscle and flexibility — cutting down on shut-downs and maintenance.

Whatever your business, if gas or liquid plays a part, Chiksan's Research and Development Division can help you add efficiency, safety and economy to your operation.

Representatives in Principal Cities
Write for Catalog 53-C, Dept. GOJ-1

CHIKSAN Ball Bearing Swivel Joints are THE NEW TOOL of Modern Industry — with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles and sizes have been developed for pressure and services from 29" vacuum to 15,000 psi and for temperature ranges from minus 75° to + plus 800° F., with packing materials for each specific type of service.



The Flow of Enterprise Relies on **CHIKSAN** *Ball-Bearing Swivel Joints*

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 75, Illinois • Newark 2, New Jersey

MURPHY DIESELS

are rugged, dependable, economical

Says:

John S. Hagestad
Hagestad Drilling Company
Bakersfield, California

Another in the growing list of satisfied Murphy Diesel owners is John S. Hagestad, drilling contractor of Bakersfield, Cal. He reports his experience as follows:

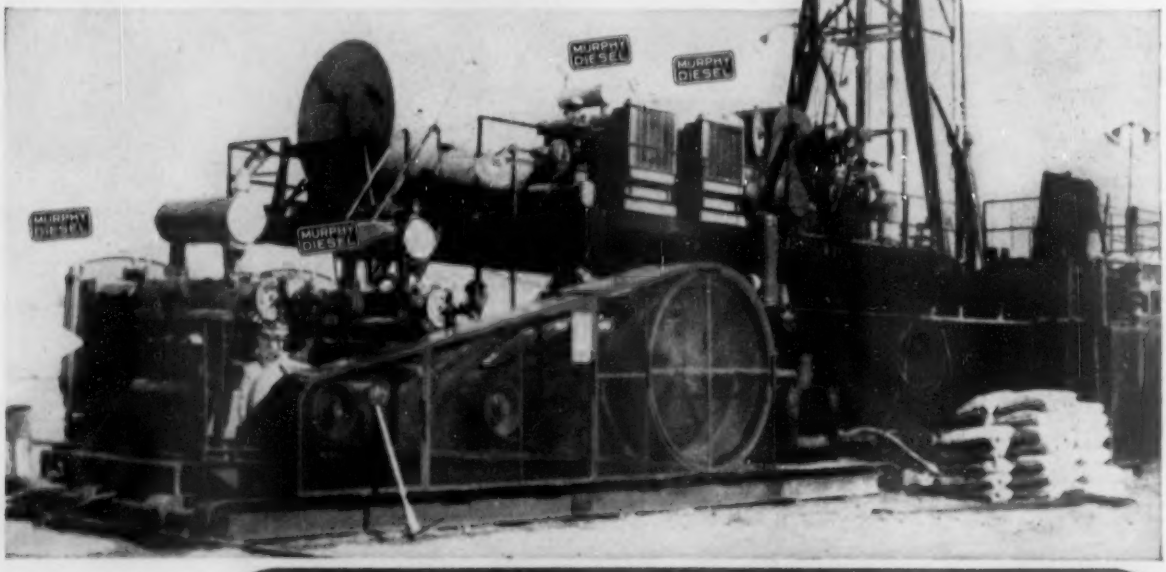
"The two Model 20 G Dual Fuel Murphy Diesels on our new Emsco G. B. 350 drawworks have performed satisfactorily in every respect. Our entire crew is pleased with their ruggedness and dependability which are most suitable for oilfield operation. We have already observed economy in fuel savings.

"We also have two Model 220 G Murphy Dual Fuel engines driving our D-300 Emsco Pump (7¼ - 14") at 70 strokes per minute. Under these conditions pressures and volume are ample for jet bit drilling."

Mr. Hagestad has demonstrated his sincerity with an order for four more Murphy Diesels. This is real proof of satisfaction. You, too, can get this same kind of satisfaction. The first step is to ask your Murphy Diesel Dealer to show you what Murphy Diesel Power can do for you.

MURPHY DIESEL CO. | **5305 W. Burnham St. Milwaukee 14, Wisconsin**

Murphy Diesel Engines and Power Units are available in sizes from 90 to 240 H.P. Dual Fuel engines from 135 to 215 H.P. Generator Sets, 60 to 154 K.W.



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SEE YOUR MURPHY DIESEL DEALER, TODAY—

ALBUQUERQUE, NEW MEXICO, Lively Equipment Company; BUTTE, MONTANA, Hall-Perry Machinery Company; CORPUS CHRISTI, TEXAS, Houston Engine & Pump Company; DALLAS, TEXAS, Conley-Lott-Nichols Machinery Co.; DENVER, COLORADO, Power Equipment Company; EDMONTON, ALBERTA, CANADA, Northern Engine & Equipment Co., Ltd.; GREAT BEND, KANSAS, Manufacturers Dist. Co.; GREAT FALLS, MONTANA, Hall-Perry Machinery Company; HOUSTON, TEXAS, Houston Engine & Pump Co., Inc.; JACKSON, MICHIGAN, Utility & Industrial Supply Co.; LOS ANGELES, CALIFORNIA, Industrial Engine Service; LUBBOCK, TEXAS, Conley-Lott-Nichols Machinery Co.; SAN ANTONIO, TEXAS, The Roy Klossner Company; BAKERSFIELD, CALIFORNIA, Glenn Rose Engine Service; ODESSA, TEXAS, Conley-Lott-Nichols Machinery Co.; LONGVIEW, TEXAS, Nichols Machinery Co.
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MURPHY DIESEL

UNIBOLT

Flow-rated "X" beans

Christmas tree equipped with UNIBOLT Flow Manifold, consisting of UNIBOLT Tee, Wing Valve and Positive Choke Body.

YOUR INSURANCE AGAINST HARMFUL OVER-PRODUCING

UNIBOLT Flow Rated X-Beans, provide control of the flow of fluid or gas with a degree of accuracy never before attained. They are drilled in increments of 5 percent and 10 percent of well flow, rather than in increments of 1/64-inch, and are individually flow-rated to assure accuracy.

If, for example, a well produces 10 bbls. through a conventional 5/64-inch choke, to increase the choke to the next largest fractionally drilled size, 6/64-inch, would increase the production to approximately 15 bbls. On the other hand, a well that produces 10 bbls. through a size X-23 UNIBOLT X-Bean would produce only 11 bbls. through the next largest size X-Bean, X-24; 12 bbls. through an X-25, and so on.

This accurate control of production is a safeguard against the harmful effect of periodically pulling a well too hard in order to make its allowable.

GAS PRODUCERS are benefiting from the use of "X" Beans because the wells can be set with a positive choke for any desired rate of production.

THORNHILL CRAVER CO.

P. O. BOX 1184 • HOUSTON, TEXAS

He helps teachers in 54,000 classrooms

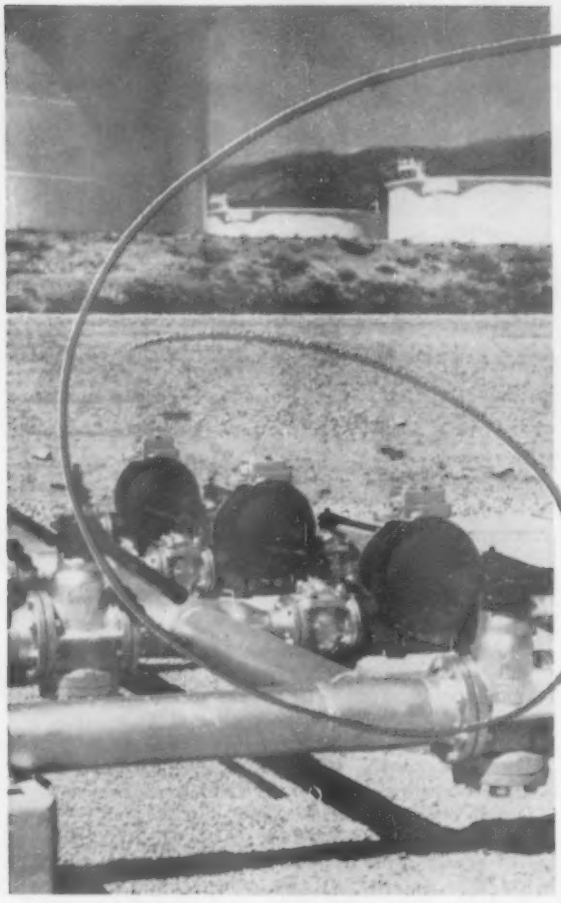
Radio was barely out of the earphone stage 26 years ago when a new program was beamed from a San Francisco studio. It featured a string trio and was based on the idea that good music, when clearly understood, could entertain and teach, too. Actually, only 72 Western schools had radio sets then, but with that performance the Standard School Broadcast was "on the air."

Today, when Conductor Carmen Dragon lifts his baton, it's "time for the Standard School Broadcast" in over 54,000 classrooms through the West, Alaska and Hawaii. Counting children, teachers and home listeners, the program reaches a weekly audience of nearly 1½ million. That string trio has grown to a symphonic orchestra with a dramatic cast, choral group and guest vocal and instrumental artists. Selections range the musical alphabet from symphony to jazz. Each year's course follows a carefully planned outline published in a manual supplied to teachers by Standard to serve as a guide in blending music-enjoyment with subjects like art, literature, social studies. Now in its 27th year, the Standard School Broadcast is radio's oldest education program, heard today over more than 100 stations. Its goal is to help Western children gain an absorbing new interest in the world's good music, and —through music—a broader knowledge and understanding of the world around them.

Listen to the Standard School Broadcast every Thursday. Check your newspaper radio log for the time and station.

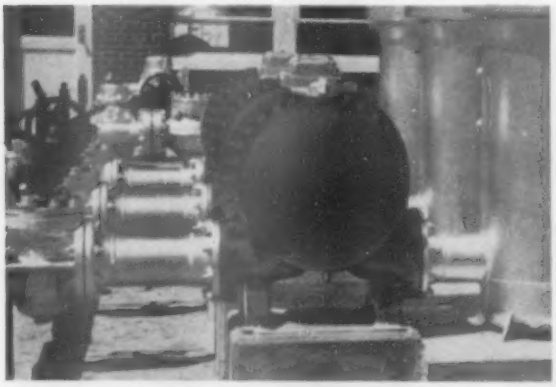
STANDARD OIL COMPANY OF CALIFORNIA

75 years of planning ahead to serve you better



Brodie BiRotor Meters installed on products pipeline at terminal take-off.

Installation of Brodie BiRotor Meters on products pipeline at head of line station.



For sustained accuracy and low maintenance cost in continuous pipeline service

- Double case construction avoids piping strains and pressure distortion of measuring unit
- Rugged all-welded steel housing insures long enduring service life
- Readily accessible unit-built assemblies permit quick easy service
- Completely self-lubricated bearings eliminate frequent attention or service
- True rotary principle combines free flow with positive displacement accuracy

With rugged in-built stamina, Brodie BiRotor Meters are proving their lasting efficiency in continuous pipeline service. Balanced engineering design combined with precision manufacturing gives you the most meter for your money. When periodic cleaning or inspection is required, just four interchangeable unit-built assemblies are readily accessible without disturbing existing line connections. For crude and finished product lines, gathering systems, and product blending, consult your Brodie Meter Specialist. He'll be glad to furnish experienced help in solving your metering problems and needs.

BRODIE BiRotor METERS

ALL-STEEL TRUE ROTARY

RALPH N. BRODIE COMPANY · San Leandro, California, U.S.A.

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550 So. Columbus Ave.	39 E. Van Buren	167 Parkhouse St.	221 9th Ave. N.	5401 E. Shella Street

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

All SHELL AND TUBE ...HEAT EXCHANGERS by Vogt

ABOVE: View of new construction at Louisville Refining Company.

BELOW: Some of the many Shell and Tube Exchangers.

Engineered and Licensed by UNIVERSAL OIL PRODUCTS CO.

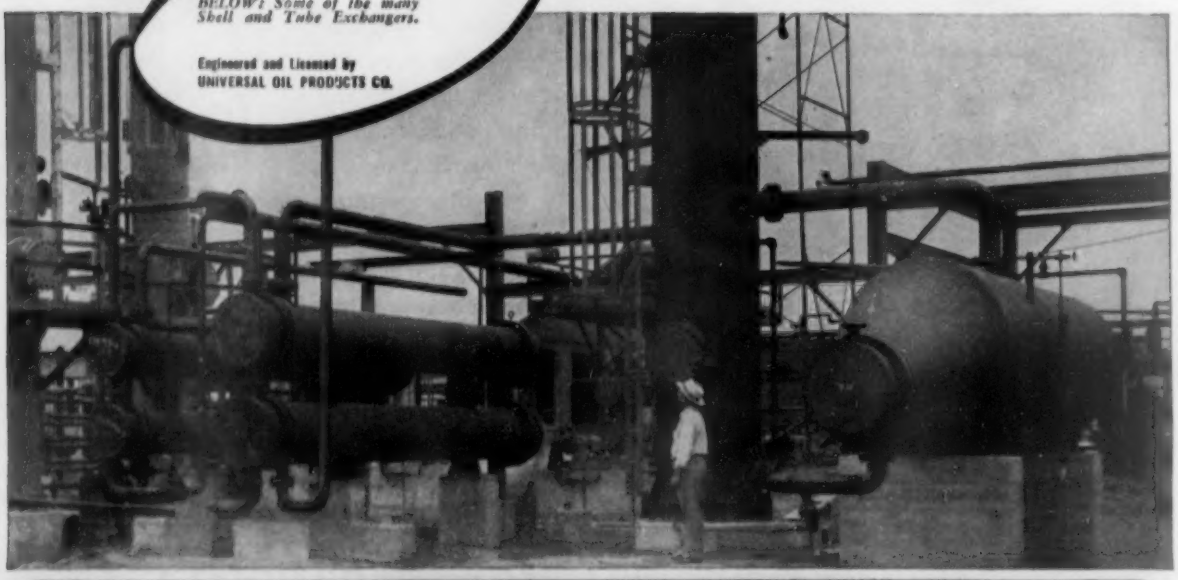
At LOUISVILLE REFINING CO.'S New CATALYTIC CRACKING PLANT

Premium gasoline production has been boosted 20% from the same amount of oil charged since the Louisville Refining Company's new Catalytic Cracking Plant went on stream.

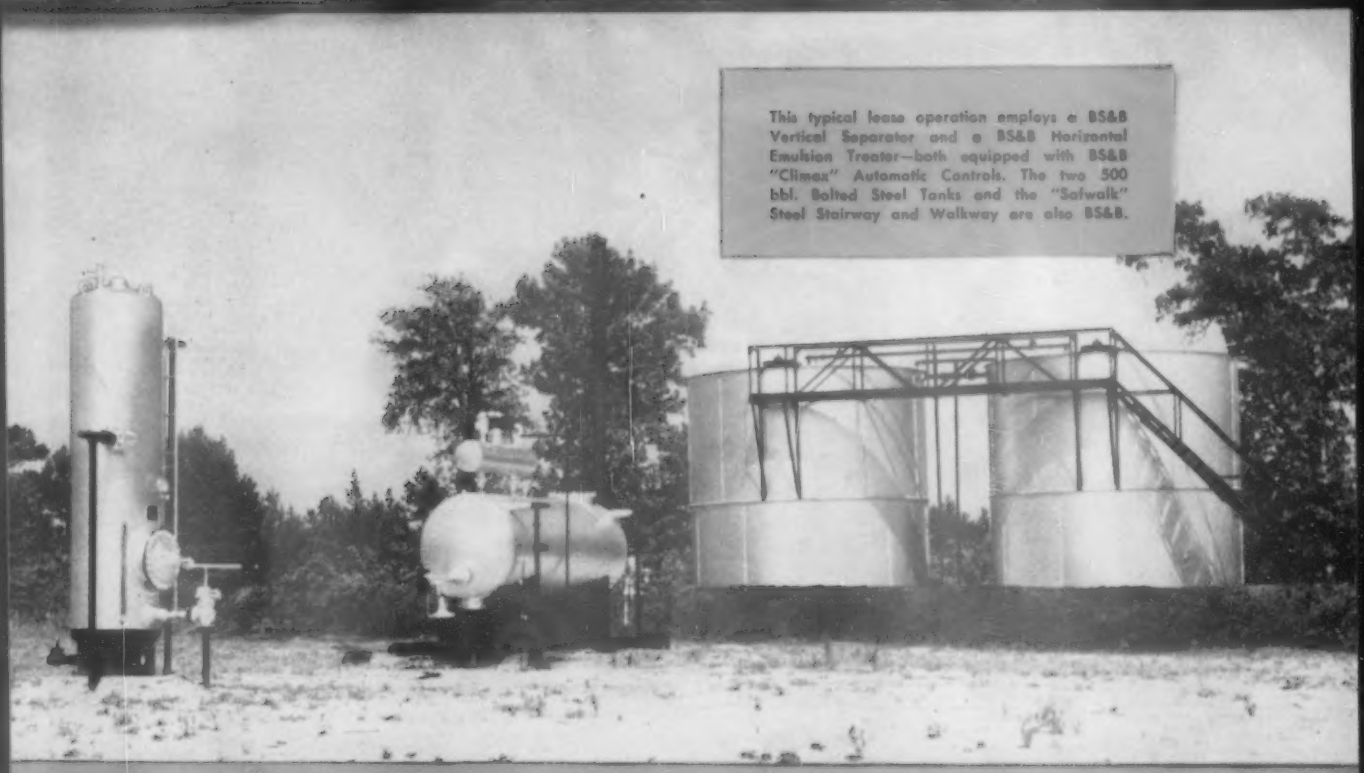
The new plant uses Vogt Shell and Tube Heat Exchangers exclusively and they make a significant contribution to the efficient and economic operations of this progressively modern refinery.

Vogt Shell and Tube Heat Exchangers are available in many different types, with fixed or removable tube bundles, to meet the special problem and specific operating conditions of each installation. They are constructed from carbon and special steels to meet every temperature, pressure, or vacuum service requirement.

WRITE FOR BULLETIN HE-6



HENRY VOGT MACHINE CO. Louisville 10, Ky. • BRANCH OFFICES: NEW YORK, PHILADELPHIA, CHICAGO, CLEVELAND, ST. LOUIS, DALLAS, CHARLESTON, W. VA.



This typical lease operation employs a BS&B Vertical Separator and a BS&B Horizontal Emulsion Treater—both equipped with BS&B "Climax" Automatic Controls. The two 500 bbl. Bolted Steel Tanks and the "Safwalk" Steel Stairway and Walkway are also BS&B.

For Faster Payout, Greater Profits And A More Efficient Operation...

...Equip Your Lease 100% BS&B!

For more than six decades—almost as long as there has been an oil industry—BS&B has enjoyed a position of leadership in the manufacture of quality oilfield production equipment.

This leadership has been born of our never-ending effort to improve on the "established" ways of doing things, and of our continuing program of engineering research, pioneering and the development of equipment which out-performs all others—with faster payout and greater profit for you!

Next time you put a lease on production, why not do as many other profit-wise operators are doing these days—equip your lease 100% BS&B!

BS&B Offers A Complete Line of Oilfield Production Equipment!

Bolted Steel Tanks . . . Welded Steel Tanks . . . Wood Tanks . . . Oil and Gas Separators . . . Free Water Knock-outs . . . "COLD-FRAC" Low Temperature Separation Units . . . Stabilizers . . . Heaters . . . Emulsion Treaters . . . Gas Dehydrators . . . Gas Desulfurizers . . . Chemical Feeders . . . "CLIMAX" Automatic Control Equipment . . . Walkways and Stairways . . . Safety Heads . . . Special Fabrication.

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY

For detailed information, consult your BS&B Representative—or write to us direct.

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A1

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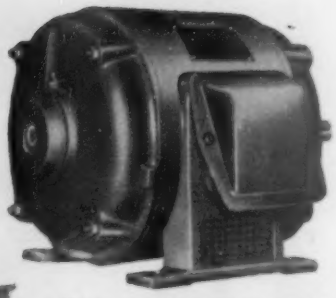
NEW Century Weather GARD

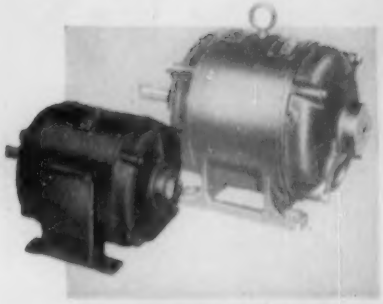
OIL FIELD MOTORS

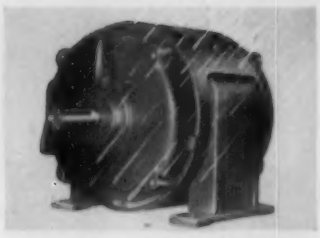


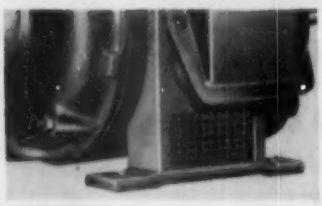
These are the new re-rated motors — now available in some ratings.

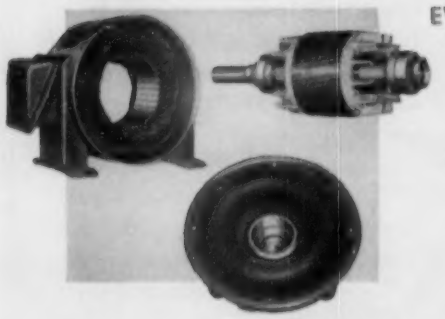
Improved

to Provide Top Performance ... Long Life









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More uniform silicon-laminated steel; thinner, tougher "Mylar" slot insulation—just two of the many technical developments that help make these new Century Performance Rated Motors so much smaller and lighter.

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New internal motor ventilating methods permit end bracket and frame design that gives far better protection from rain, snow and sleet . . . still maintain 40°C. temperature rise.

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Screens in openings protect against birds, small rodents or animals, leaves or twigs from entering the motor.

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Improved plastic impregnating varnish and plastic insulated magnet wire provide unusual resistance to abrasion, moisture and heat. These new materials possess far better dielectric qualities. Die cast aluminum rotors are individually, dynamically balanced to assure freedom from vibration.

For more information *on these and other Century motors for the petroleum industry, see your supply store, or write Century for Oil Industry Bulletin 14-141-P1.*

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1/6 to 400 H.P.

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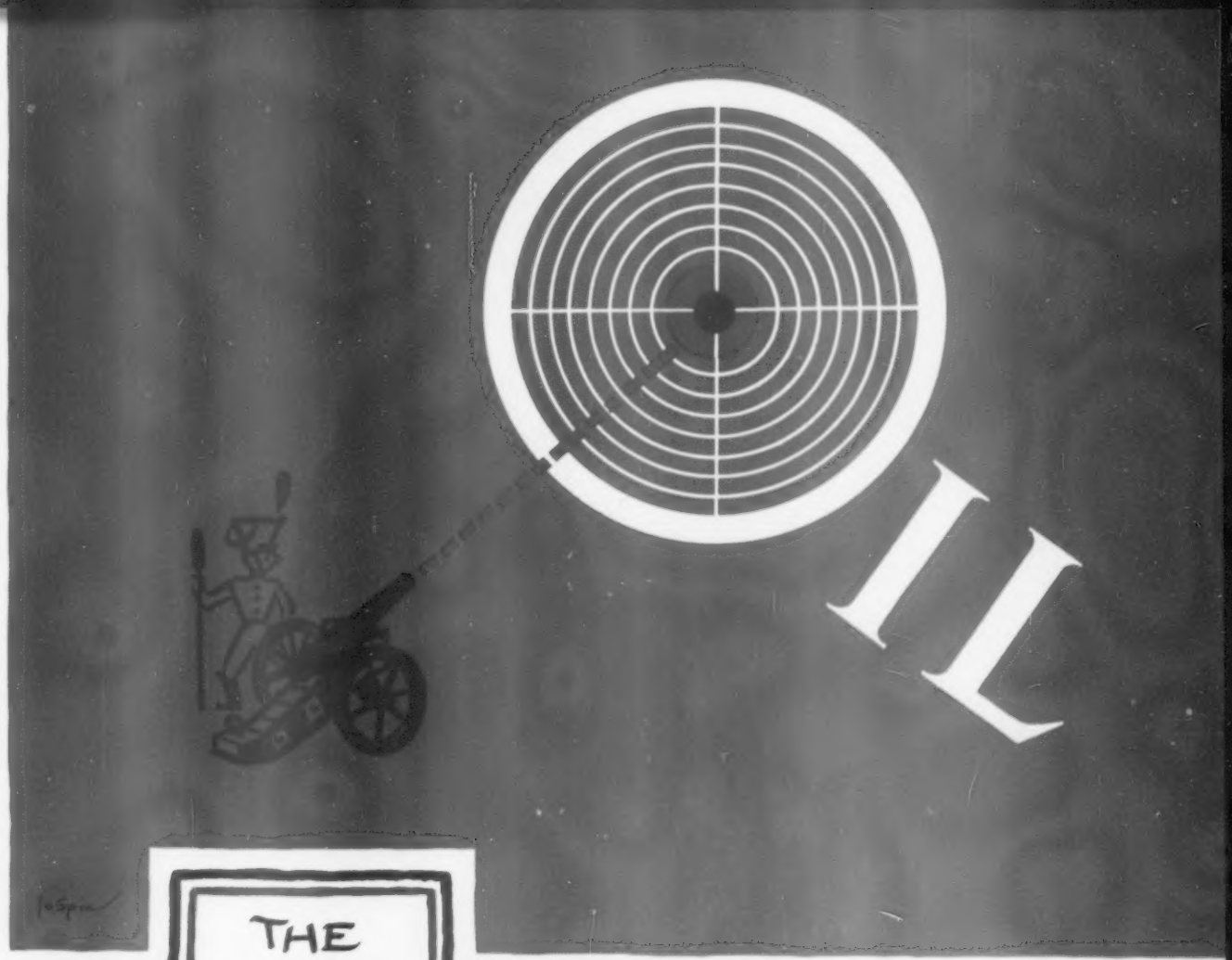
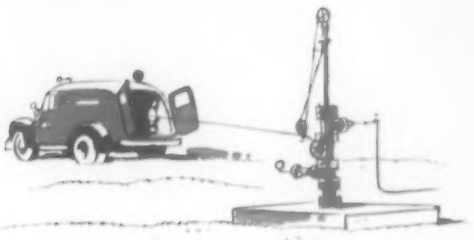


THE LITTLE GUN WITH THE BIG RESULTS



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Midland, Texas	Great Bend, Kan.	Hobbs, N. M.	Williston, N. D.
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Butler's die-formed, precision-punched sheets are erected fast, skillfully by your nearby Butler distributor's trained experienced workmen.

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They Say—

What Control Might Bring

"The price which the producer is to receive for his gas will be the main target of the regulation (of gas sales by the federal Government). The question is whether such regulation is wise. It is one all of us must try to consider without bias in the light of what is best for our country both today and tomorrow . . .

"I feel very strongly personally that free competition is far better for all of us than a price-controlled economy, which historically has led to stagnation, scarcity, and rationing. And I see no reason to set up an OPA for natural-gas producers than to impose price controls on the producers of oil, steel, copper, or automobiles . . .

"As for any inference that there is a monopoly in gas production, the ten largest companies produce less than a third of the gas used in this country, and, furthermore, the production of gas has none of the characteristics of a public utility."

George V. Holton, chairman of the board of Socony-Vacuum Oil Co., Inc., in a letter to shareholders.

Southwestern Industries

"It is inevitable that industries will move to the southwestern states in order to secure gas as fuel. A large industrial plant may consume more gas than all household users in a large city."

Hines H. Baker, president, Humble Oil & Refining Co., in an address in Hollywood, Fla., before the Investment Bankers Association.

Good Year Ahead

"The outlook for 1955 seems to be quite favorable when viewed from an industry-wide position, and we are planning operations in expectation of a 3 to 4 per cent increase in West Coast and national demands. The nation's general economy, we feel, should advance throughout 1955; weather conditions may be more favorable to petroleum consumption; and, on the whole, earnings of the petroleum industry should hold up well . . .

"Abroad, the general prosperity of many European nations, as well as increasing industrialization of other

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simplify make-up,
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provide easy break-out for service,
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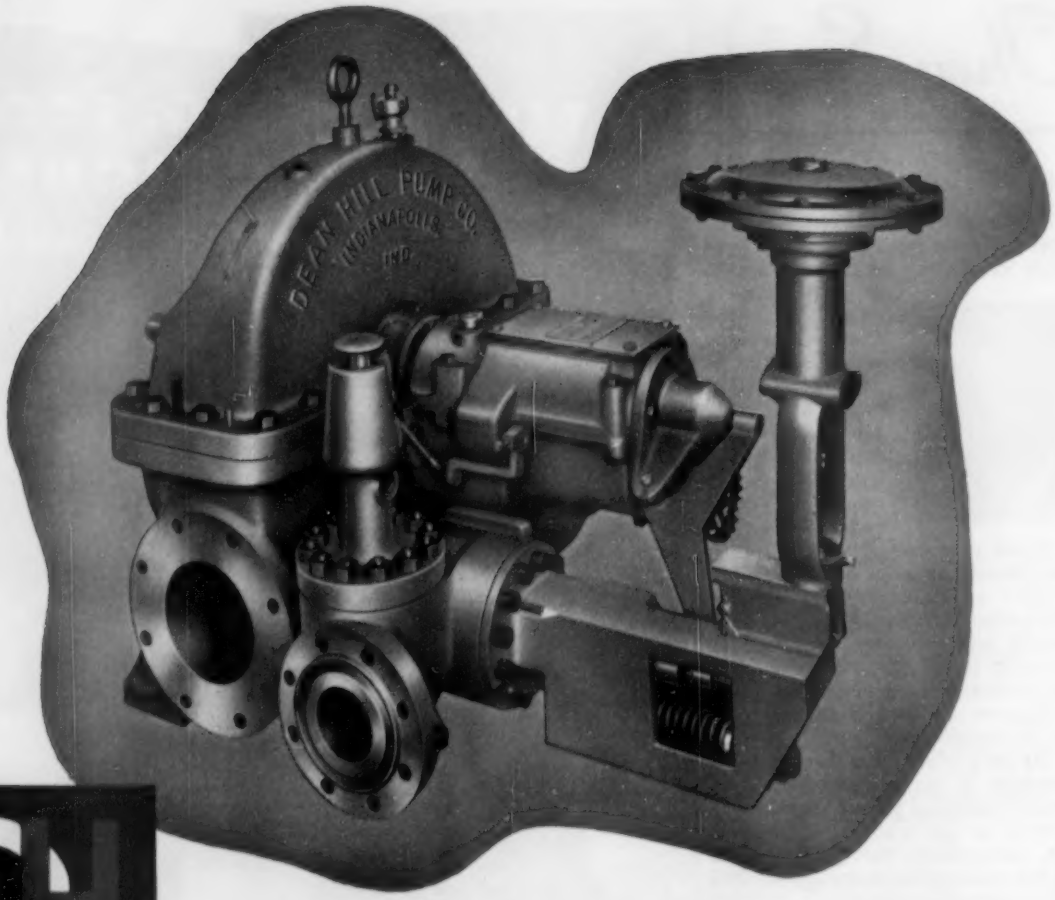

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Dean Hill Turbines equipped with pressure regulators are "made to order" for boiler feedwater applications requiring precise, automatic pressure control. Regulators can be used with any turbine model of either horizontal or vertical design and are furnished with direct-acting or remote control. They can be arranged to maintain a constant pump discharge pressure or a constant differential pressure over the boiler pressure.

The regulator controls all turbine speeds up to normal rating, but above this point the turbine governor overrides the regulator to prevent overspeeding. The emergency trip valve remains independent.

To effect maximum efficiency of control and eliminate lost motion and deflection, the regulator is mounted on a rugged support made of welded six-inch channels.

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areas, is an encouraging factor when viewed in the light of their probable demands for more petroleum products. It is expected that these demands in 1955 will increase by 6 per cent or more over the requirements of foreign markets in the past year."

T. S. Petersen, president, Standard Oil Co. of California.

Why Build a Super Crude Line

"I expect to see a continuation of the trend toward larger diameter crude-oil lines . . . This does not mean, however, that I believe we are going to get that 36-in. super-line that I mentioned has been proposed in some quarter. It has been promoted as a possible defense facility, the idea being that in case of war it would be an excellent thing to have such a line handy . . .

". . . If it were put into use now, it would kill off our tanker trade completely . . . Further, I can see no justification for building the line unless we blindly assume that the next war, if there is one, will be fought exactly as the last one was . . . We would look much worse than silly if we built a line like this at a cost of $200 million and up and then had the eastern refineries bombed out of existence in the first days of the war

"So while I do see a trend to larger-diameter crude lines, I see little justification for the actual construction of the proposed 36-in. giant from the Southwest to the East Coast in peace time . . ."

Richard E. Nelson, Jr., assistant general manager, supply and transportation department, Standard Oil Co. (Ind.), at the University of Texas, Department of Geology Seminar.

"Frosty" Capital

"I must warn you that we must not allow ourselves to become so dazzled by technological possibilities that we are blinded to economic realities . . .

"In Texas, we have made great strides in conservation of gas through construction of plants and building of pipelines, but I must say that some of our idealistic achievements conservationwise did not —and could not—come about until they could be justified on a sound dollar basis . . .

"The things we do must be forged under the stern pressure of consideration for the safety—plus an opportunity for growth—of each dollar involved . . . These decisions must be made by those who also have the major responsibility for success of the project . . . Those who carry the responsibility must also appear somewhat on the conservative or cautious side. It is for this reason that successful oil operators are very wary of subsidizing one phase of their enterprises at the expense of another. Each enterprise . . . must stand on its own merits as having a reasonable chance for success . . .

"The subsidization of uneconomic enterprises has the effect of freezing capital and capital does not respond well to frosty conditions . . ."

Harry W. Bass, president, Texas Mid-Continent Oil and Gas Association, in an address in Calgary before the annual meeting of the Canadian Petroleum Association.

Hold That Line

"Members of the Texas Railroad Commission took the oil-import bull by the horns and twisted its neck by increasing the Texas allowed production for January to 3,216,123 bbl. daily. This jumped Texas production close to its November 1952 peak . . .

"The commission's move eliminates the chance for importers to bring in foreign oil on the grounds it is needed to meet winter demand for crude . . .

"It is hoped that the commission will now hold the line. If the market becomes overloaded, it will be because of foreign imports. The responsibility can be clearly fixed . . ."

Editorial in the Houston Chronicle.

CALENDAR OF EVENTS

1955

JANUARY

10-14 Society of Automotive Engineers, golden anniversary annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

17-18 Kansas Oil Men's Association, annual convention, Baker Hotel, Hutchinson, Kans.

17-19 Pipe Line Contractors Association, annual convention, Hotel Statler, Los Angeles.

26-28 Symposium on instrumentation for process industries, A. & M. College of Texas, College Station, Tex.

27-28 American Chemical Society, symposium on hydrocarbon chemistry, Rice Hotel, Houston.

27-28 Southern California Meter Association, fourth annual instrument short course, Los Angeles Harbor Junior College, Wilmington, Calif.

31-Feb. 2 Sixth annual Southeastern Symposium on Industrial Instrumentation, University of Florida campus, Gainesville, Fla.

FEBRUARY

10-12 Seventh Southwestern IRE Conference

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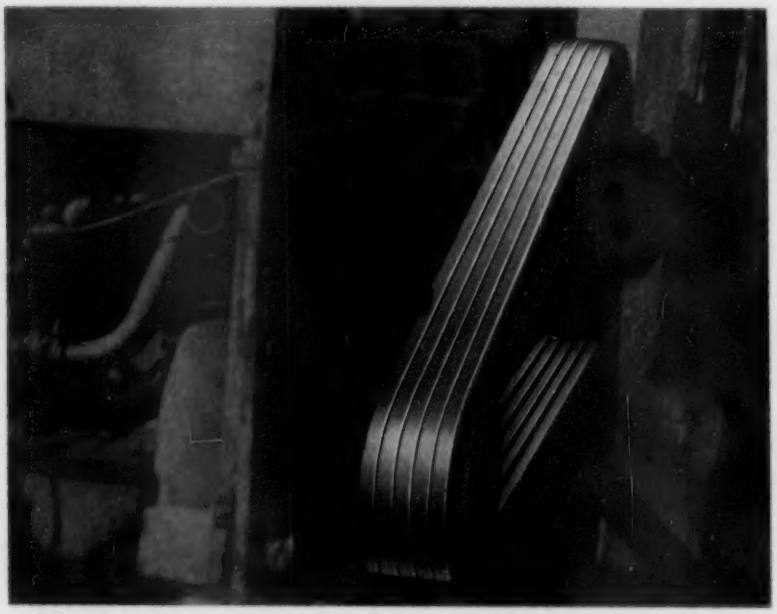

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Dayton Thorobreds are designed and built to deliver dependable, continuous power in any kind of climate or weather. Not only do Thorobreds perform more economically and longer, but they deliver full power! Here are some of the reasons: The cover consists of rubber-filled, bias-cut "Hy-Twist" fabric for better flexing, longer wear. Inside is the load-carrying section consisting of pre-stretched rayon cords, with each filament rubber-coated, for greatest tensile strength, flexibility and high resistance to fatigue. Get Dayton Thorobred V-Belts from conveniently located Dayton distributor warehouse stocks.

To help you solve your power transmission problems, Dayton's Field Engineering service is available on a 'round-the-clock basis. Write direct to Dayton Rubber Company, Industrial Division, Dept. 701, Dayton 1, Ohio.

1. "Hy-Twist" fabric for all weather
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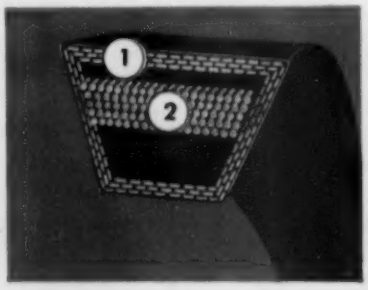

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DAYTON RUBBER CO., INDUSTRIAL DIVISION, DAYTON 1, OHIO

and Electronics Show, Baker Hotel, Dallas.

13-17 American Institute of Mining and Metallurgical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.

13-18 A.S.T.M. Committee D-2 on Petroleum Products and Lubricants, Rice Hotel, Houston.

14-16 Rocky Mountain section of A.A.P.G., annual regional convention, Billings, Mont.

16-18 National Association of Corrosion Engineers, sixth annual short course for pipeliners, Mayo Hotel, Tulsa.

23-24 Pacific Coast Gas Association, seminar on electronic data processing, Los Angeles.

25 National Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

1-2 American Gas Association committee on natural gas reserves, Baker Hotel, Dallas.

4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.

7-11 National Association of Corrosion Engineers, Palmer House, Chicago.

9-11 American Petroleum Institute, Division of Production, Southwestern spring meeting, Jung Hotel, New Orleans.

17-18 Southern Gas Association, Distribution Management Conference, Jung Hotel, New Orleans.

20-23 American Institute of Chemical Engineers, Kentucky Hotel, Louisville.

23-24 Pacific Coast Gas Association, accident prevention conference, Santa Barbara, Calif.

23-25 American Petroleum Institute, Division of Production, Mid-Continent District, Herring Hotel, Amarillo, Tex.

27-29 Texas Independent Producers and Royalty Owners Association, ninth annual meeting, Hotel Texas, Fort Worth.

28-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Exploration Paleontologists and Mineralogists, annual meeting, Hotel Statler, New York.

28 April 1 American Society for Metals, 9th western exposition and congress, Pan American Auditorium, Los Angeles.

APRIL

5-7 Corrosion control short course, sponsored by University of Oklahoma and Central Oklahoma Section of National Association of Corrosion Engineers, University of Oklahoma Extension Study Center, Norman, Okla.

7-8 Rocky Mountain District, American Petroleum Institute, Division of Production, Gladstone Hotel, Casper, Wyo.

13-15 Natural Gasoline Association of America, annual convention, Baker and Adolphus hotels, Dallas.

13-15 American Society of Lubrication Engineers, tenth annual meeting, Hotel Sherman, Chicago.

13-15 National Petroleum Association, 52nd semiannual meeting, Cleveland Hotel, Cleveland.

18-20 American Society of Mechanical Engineers, spring meeting, Lord Baltimore Hotel, Baltimore.

19-20 Pacific Coast Gas Association, distribution conference, Phoenix.

19-21 Southwestern Gas Measurement Short Course, North Campus, University of Oklahoma, Norman, Okla.

20-22 Petroleum Industry Electrical Asso-

ciation, annual conference, Shamrock Hotel, Houston.

25-26 Independent Petroleum Association of America, midyear meeting, San Antonio.

28-29 American Petroleum Institute, Division of Production, spring meeting of Pacific Coast district, Statler Hotel, Los Angeles.

MAY

1-4 Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.

1-4 American Institute of Chemical Engineers, Shamrock Hotel, Houston.

9-10 American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.

9-12 American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.

11-12 Pacific Coast Gas Association, gas supply and transmission and conference of technical session, Palm Springs, Calif.

11-13 American Petroleum Institute, Division of Production, Eastern District spring meeting, William Penn Hotel, Pittsburgh.

12-19 Sixth Latin American Congress of Chemistry, Caracas, Venezuela.

14-22 World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt Germany.

16-18 American Petroleum Institute, Division of Transportation, products pipeline conference, Edgewater Beach Hotel, Chicago.

16-18 Southern Gas Association, New Orleans.

23-25 American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.

26-27 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.

30-June 1 Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

5-9 Canadian Gas Association, annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont.

6-10 American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.

6-15 Fourth World Petroleum Congress, Rome, Italy.

9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.

9-10 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

11-15 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

12-17 Society of Automotive Engineers, golden anniversary summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

16-18 Interstate Oil Compact Commission, Denver.

20-23 American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Boston.

28-July 1 American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

AUGUST

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.

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Scientific Advance in Head Protection

Internal as well as External head protection achieved by patented "geodetic" suspension in New Willson Super-Tough® Hats and Caps.

Realizing that most fatal head injuries are due to shock to the brain rather than injury to the skull, the Cornell Aeronautical Laboratories designed and patented a new suspension system for industrial safety hats that provides maximum protection and comfort to the wearer.

This patented suspension is available only in Willson Super-Tough® Hats and Caps!

This suspension is made up of "geodetic" crown straps scientifically located to distribute the force of a blow over the entire head—not concentrate it in a small area on the crown of the head. In addition, the tough Fiberglas hat shell is made safer and more comfortable to wear by the pneumatic cushioned head band. This pneumatic cushion absorbs and distributes the force of lateral blows through a series of metered, interconnected air cells.

Write today for the new Willson Super-Tough® hat bulletin which describes in detail the "why and how" of these new Willson Super-Tough® hats with the advanced, patented suspension.

Clip and mail coupon for latest head safety information.

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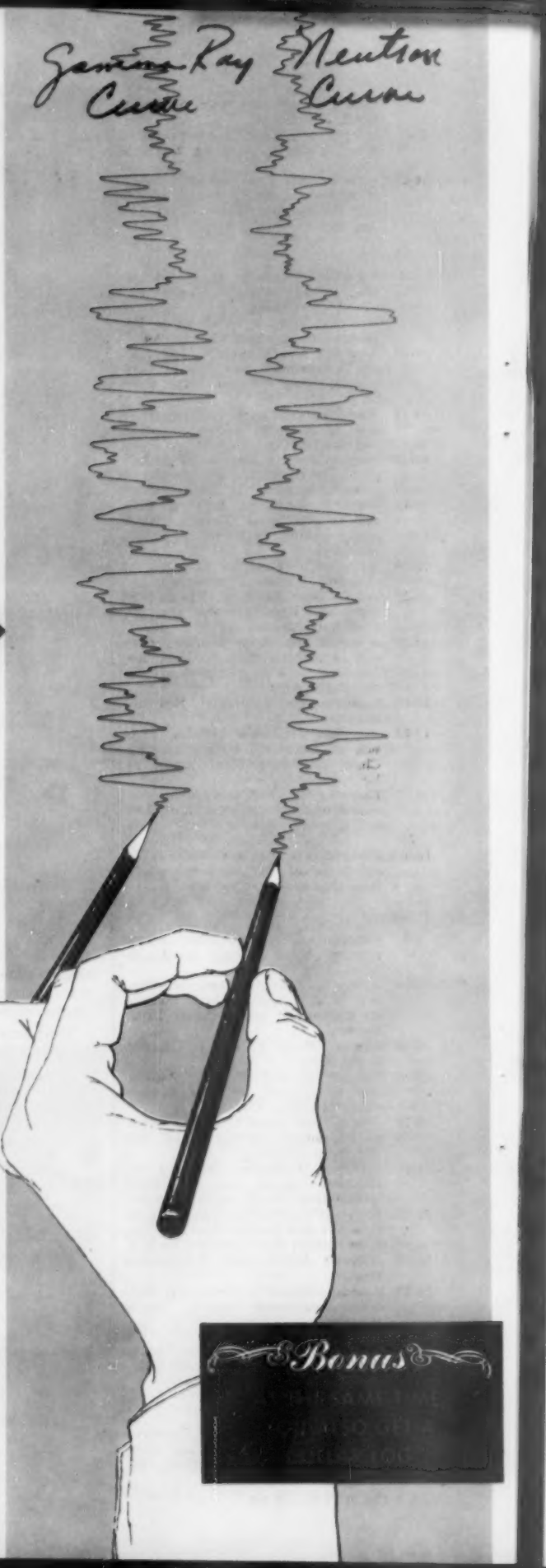

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THE OIL AND GAS
JOURNAL

TULSA, OKLAHOMA

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JOURNALLY Speaking

Big Ten

WHAT were the 10 biggest oil stories of 1954? In retrospect they can be seen as continuing developments which ran through the entire year—chains of events which culminated in some sort of a climax—trends which strengthened into unusual significance—things most talked about by the industry.

So many things happened in this fast-moving industry last year that there is room for wide difference of opinion as to their relative importance. Here's our selection for the 1954 Big Ten:

1. Federal control of gas . . . Consternation, confusion, and chaos were mild terms to describe the effects of the Supreme Court decision telling the Federal Power Commission to regulate production of natural gas. The only agreement was that the industry will never be the same again if Congress doesn't amend the law.

2. Chronic oversupply . . . The industry overestimated the 1954 demand and all through the year there was too much oil—too high rates of domestic production, imports, refinery runs, inventories. This caused trouble all around: severe cuts in allowables, soft markets, price cutting, gasoline wars, pipeline proration, and some downward adjustments of crude prices.

3. Boom in the Rockies . . . Exploration and discovery reached new peaks in the Rocky Mountain states and mounting production pushed east and west through new crude and products pipelines, affecting producers in California, the Southwest, and clear into Michigan and Ohio.

4. Offshore development . . . Final settlement of most aspects of the long controversy over jurisdiction opened the waters off California, Louisiana, and Texas. The first federal leases in the Gulf of Mexico brought fabulously high bonuses. Ingenious devices for deep-water drilling made their appearance. Oil and gas discoveries began to substantiate the belief that the coastal waters will yield enormous reserves.

5. High imports . . . Imports of crude and products increased their share of the domestic market. This was a prime issue with domestic producers throughout the year, culminating in a determination to demand that Congress impose limitations.

6. Gasoline improvements . . . The octane race reached a crescendo, additives and improvers of divers variety appeared in bewildering numbers, and refiners rushed to put on stream catalytic reformers and other new process units to upgrade their products.

7. Iran's return . . . After 3 years of hibernation in nationalization, the Iranian oil industry, once the dominating factor in the Eastern Hemisphere, reentered the world's markets. A triumph of petroleum diplomacy, this ushered in a new era of American participation in Middle East operations and a reshuffling of world markets and distribution.

8. Pacific Northwest gas . . . Years of dickering and bickering culminated in a multi-company agreement for a pipeline grid serving half the continent, to bring gas to the Northwest and stimulate exploration and production all along the Rockies from the Mexican border to the Canadian Far North.

9. Reservoir repressuring . . . Water-flooding and gas-injection advanced significantly in number and size of projects, in research and application of new technology, in volume of reserves slated for ultimate recovery, and in general acceptance by the industry.

10. Automation . . . The use of electronic computers, punch-card records, instrumentation, remote controls, and automatic devices of many kinds spread like wildfire through every activity of the industry, promising a new era in operating methods and efficiency.

Hindsight is better than foresight, but coming events cast their shadows before. What will be 1955's biggest stories? More of the same? Or will something entirely new dominate the headlines? We can hardly wait to find out.

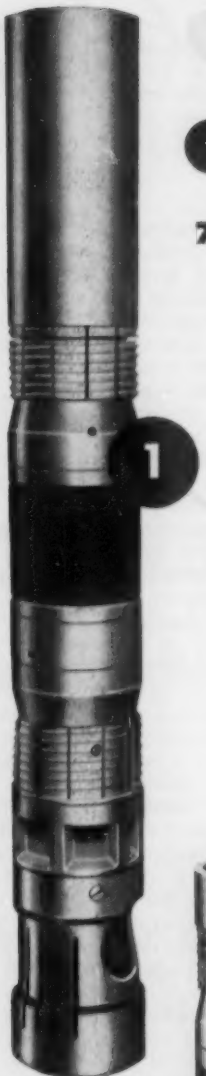
Henry D. Ralph.

- A SINGLE SET-UP permits perforating, and setting of BAKER Packer, Bridge Plug of Cement Retainer.
- YOU SAVE VALUABLE TIME over setting on tubing or drill pipe.
- ACCURATE, CORRELATED SETTING DEPTH is simple with wire line measurements.
- PREMATURE SETTING IS MINIMIZED through the use of accessory equipment.
- WIRE LINE SERVICE COMPANIES can set THESE DEVICES for BEST RESULTS.
- MORE POSITIVE SETTING with exclusive BAKER Setting Mechanism.
- YOU SAVE WEAR AND TEAR on tubing or drill pipe.

7 REASONS WHY...

Wire Line Setting

of these BAKER Tools Saves Time, Money and Trouble



Baker Retainer Production Packer Product No. 415-D

Baker Cement Retainer Product No. 400

Baker Wire Line Bridge Plug Product No. 400-N

FOR HELPFUL SUGGESTIONS as to how Baker Retainer Production Packers, Baker Wire Line Bridge Plugs and Baker Cement Retainers can make *your* operations more profitable, contact the Baker representative in your area. His knowledge is based upon applications in nearby wells, and he can give you *specific recommendations* to help solve *your* problems.

1. **BAKER RETAINER PRODUCTION PACKERS** *virtually become a part of the casing string* when set. The tubing string can be run through the packer, sealed off in the bore of the packer, but is readily removed *without disturbing the packer.* Down-hole tools are run through this "free" tubing string for operations below. The *entire packer can be drilled out readily.* They are easily installed for Single - or Dual-Zone Production; for Testing, Acidizing, Re-pressuring, Cementing, and other applications.

2. **BAKER WIRE LINE BRIDGE PLUGS** *set positively, hold against any pressure safe for the casing,* (from above or below) *and are easily and quickly drilled up.* Made of Cast Iron or of Magnesium to meet varying conditions imposed by well fluids or length of installation time.

3. **BAKER CEMENT RETAINERS** are constantly being improved and are always reliable for all types of squeeze or remedial cementing, testing, plugging-off, and similar applications. They are easy to run—pack off positively—hold any pressure safe for the casing. Readily used as casing bridge plugs.

Contact your choice of these leading service organizations who are licensed to use the Baker Wire Line Setting Mechanism and other accessories for setting these Baker Tools . . .

The Ford Alexander Corporation
Bird Well Surveys
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Lane-Wells Company
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Cautious optimism is the word for 1955

OPTIMISM is the keynote for 1955 as the new year opens. Leaders in virtually every line of business predict increased production and sales. No boom, but economic good health and general prosperity is the prevailing outlook.

Many forecasters, in fact, are more optimistic than the usually optimistic oil industry. Oil men were so disappointed at the failure of 1954 activity to come up to expectations that they have been a bit slow to get far out on a limb with rosy expectations for 1955. This is a wise attitude.

THE PRESENT OUTLOOK FOR PETROLEUM is an increase of around 4 or 5 per cent in demand and general level of activity in the United States for 1955 as a whole. This is only about half the increases of several postwar years—years that made the industry really hump—but it's about on the pattern of the average growth over a long period.

Compared with 1954's increase in demand of little over 1 per cent, the outlook for this new year represents a lot of barrels of oil. If reflected with reasonable evenness throughout the industry, the increase should mean somewhat higher levels of activity in exploration, drilling, production, refining, transportation, and sales all around.

OPTIMISM IS A FINE THING—a necessary, a healthy, a stimulating attitude—for any individual or any industry. But it has dangers. It's intoxicating. It feeds on itself. It needs to be tempered with caution to keep it from blinding judgment and breeding excesses.

Cautious optimism should be the keynote of the petroleum industry for 1955. With capacity presently more than adequate to serve current demands, only routine expansion of facilities will be needed. Later in the year, if it then appears that 1956 and subsequent years will see a continued expanding economy, plans for the future can be sketched in bolder lines.

CRUDE PRODUCTION IS A CASE IN POINT. Last month, encouraged by the brisk winter demand for products and buoyed by the general feeling of optimism, several states boosted allowables by sizable amounts. This is all right temporarily, for stocks are not excessive now.

But the ability of purchasers to handle more crude should be viewed as a seasonal trend, not a sign that demand is or will be unlimited. If demand slacks off toward the end of the heating season, the lid may have to be clamped on crude supply to avoid the troubles of oversupply which plagued the industry all last summer.

In other divisions of the industry, likewise, the rein of caution should be kept on this wonderful, welcome feeling of optimism.

Those Not-So-Small Details

Standard Oil Co. (N. J.) Photo

● Placing the measuring line over the sheave is one of the small details that mean a lot in a safe, successful cementing job. There are many parallels in producing cements to meet the wide range of conditions encountered in the oil fields today.

One of these is the ritual of cleaning and checking laboratory apparatus before each test. Every detail counts, in controlling quality to assure dependable performance, even under the highest pressures and temperatures in deep, hot wells—and in assuring resistance to sulphate action, to protect the casing against corrosion.

Careful attention to all the not-so-small details is the Oil Man's assurance of the properties needed for a first-class cementing job.

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This Is the First of The Journal's New Front Covers . . .

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Each week the cover will illustrate a "cover story" or spotlight one of the many special issues the Journal prints each year.

It's something new for the Journal. What could be more fitting than devoting the first cover to the new lease on life which Ellenburger production has given West Texas?

West Texas has been good oil country for a quarter of a century, but it has had its ups and downs. After the Spraberry boom declined, pessimists forecast a bleak future for West Texas. Development of deep reserves at 10,000-14,000 ft. during the past year changed all that. Every fourth wildcat well last year was successful and well completions in West Texas were up 13 per cent.

It won't stop there. The deep-drilling in West Texas is gaining momentum. For details on the revival, read "Ellenburger . . . It's a Magic Word in West Texas" on page 78.

L.P.G.—Growth of the L.P.G. industry is expected to be more rapid this year than in 1954, when U. S. sales reached an all-time high. . . . Greatest potential is believed to be in the home-heating field. . . . Sales in 1954 passed the 5,000,000,000-gal. total for the first time in history of the industry and set a new record for the thirty-third consecutive year. . . . Annual report by Phillips Petroleum Co. indicates at least 25 per cent of the increase was in sales for motor fuel. . . . ¶New underground storage facility for L.P.G. is proposed by The Texas Co. in Hardin County, Texas. . . . The project, approved by the Railroad Commission, is to store L.P.G. from Port Arthur refinery. . . .

NATURAL GAS—The gas industry looks back on 1954 with fond memories of another record year and forward to 1955 with confident predictions of new records. . . . American Gas Association President F. M. Banks estimates the industry will spend $3 billion between now and the end of 1957, most of it in expanding natural-gas facilities. . . . Natural gas added 17,500 miles of pipelines during 1954 and was serving 22 million customers at the end of the year. . . . Sales were up 8 per cent over last year. . . . ¶Tennessee Gas Transmission breaks into the metropolitan New York markets with FPC approval for a 243-mile, 24-in. line from Pennsylvania storage fields to Greenwich, Conn. . . . Pipeline is the result of a compromise worked out by T.G.T. and Transcontinental to share the market. . . .

PRODUCTION—Oklahoma and Kansas join the parade of states who have increased their January crude-oil allowables. . . . Oklahoma jumps its January figure to 550,000 bbl. daily, 55,000 bbl. daily above the December allowable. . . . The Kansas jump is only 5,000 bbl. daily to 330,000 bbl. . . . ¶A new tool that virtually explodes cement into perforations or a porous formation is gaining popularity. . . . The tool, offered by Welex Jet Services, saves little on service charges, but makes big savings in cement and rig time. . . . ¶Water floods that are expected to recovery an additional million barrels of oil each are presented to the Texas Railroad Commission. . . . Shell plans a Duval County flood and a group of operators propose flooding North Texas' Young County Regular field. . . .

GOVERNMENT—With Congress convening Tuesday, several big questions facing the oil and gas industry should be answered soon. . . . The three principle issues are control of natural gas, restrictions on imports, and the future of the depletion allowance. . . . ¶The federal Government will go out of the synthetic-rubber business if negotiations completed last week by the Rubber Facilities Disposal Commission are approved by Congress. . . . All but two of the 27 government plants were sold. . . . These two will be mothballed. . . .

TRANSACTIONS—Directors of Lane-Wells approve a proposed merger with Dresser Industries. . . . Whitehill Oil dissolves following the sale of $5 million worth of Northeast Oklahoma leases to Climax Molybdenum. . . . ¶Continental Production Co. buys 98 producers in California's Wilmington field from Continental Consolidated Corp. . . .

EXPLORATION—Four-company group soon will start ambitious drilling program off the coast of Louisiana on large tract covered by unitization agreement. . . . Drilling will be in deepest water yet challenged by offshore oil operators. . . . ¶Gas-distillate discoveries may spark new drilling flurry in DeWitt County, Texas, and Vermilion Parish, Louisiana.

INTERNATIONAL—Crude production in non-Communist countries outside the U. S. sets new record, exceeding 6,000,000 bbl. daily for first time. . . . ¶Proposed 65-mile products pipeline in Colombia may become a reality. . . . ¶Oil exploration in Australia will spread to new areas with arrival of drilling equipment from the U. S. . . .

MORE THAN 200,000 tractors are now powered by L.P.G. Sales for motor fuel increased 25 per cent last year

L.P.G. Records Fall Again in '54

- **Total sales reach 5,134,000,000 gallons, up more than 4 per cent over 1953 figures**

- **Industry looks to 1955 with confidence as an even better year than the one just past**

- **Use of L.P.G. for increased home heating is regarded as biggest potential for continued growth**

BARTLESVILLE, Okla. — Sales of liquefied petroleum gas in the United States set a new record for the thirty-third consecutive year in 1954, with the total passing the 5,000,000,000-gal. mark for the first time.

The 1954 increase failed to match that recorded in the preceding year, but the sales spiral is expected to soar with renewed intensity during 1955.

These are among the conclusions reached last week by Phillips Petroleum Co. in its annual year-end report on the L.P.G. industry. The report, based on nationwide estimates of 1954 sales, was prepared by George R. Benz, manager of Phillips' engineering department; Paul W. Tucker, technical representative in the engineering department; and W. F. DeVoe, assistant to the sales manager.

The report places total sales for 1954 at 5,134,000,000 gal. for a gain of 201,991,000 gal. or 4.1 per cent over the 4,932,009,000 gal. sold in 1953. Sales for 1953, based on reports by the U. S. Bureau of Mines, were up 10.2 per cent over the 1952 record, more than double the 1954 estimated increase.

While domestic sales were setting a new record, sales of L.P.G. for export rose about 30 per cent during the year, reaching an estimated total of 38,500,000 gal.

Year-end estimates by Phillips Petroleum Co. have proved a reliable guide to the L.P.G. industry's status in past years. The 1953 estimate was off less than .25 per cent from the Bureau of Mines report, which was released several months later.

What lies ahead . . . At year's end, the L.P.G. industry was looking forward to the future with the same confidence that had marked its spectacular growth in the past. The Phillips officials describe 1954 gains as "a healthy increase" and observe that "The outlook for 1955 appears even better with general upturn of business conditions."

Increased use of L.P.G. in home heating is considered the biggest potential factor in the anticipated growth of the industry. Heaters fueled with L.P.G. accounted for 28 per cent of the gas-fired floor, space, and wall heaters produced during 1954, according to the Phillips survey. The trend toward use of L.P.G. in home heating continues to move northward and is expected to add significantly to total consumption in 1955.

An estimated 402,000 L.P.G. ranges were shipped during the past year, and sales of automatic L.P.G. water heaters were estimated at 274,500. These totals are down about 10 per cent and 3.7 per cent, respectively, from the 1953 totals, but they are indicative of the continued expansion which apparently lies ahead for the L.P.G. industry.

Although sales of L.P.G. for motor fuel are not listed separately, this category was believed to be the largest single element in the industry's growth during 1954. Sales of L.P.G. for motor fuel increased at least 25 per cent last year and accounted for more than 12 per cent of total sales, according to the year-end estimates.

Continued growth also is anticipated in use of liquefied petroleum gas for industrial tractors, lift trucks, farm machinery, and secondary recovery of oil.

The industry is well equipped to supply these growing demands. Its production potential continues to increase, despite the curtailment of crude-oil production, and underground storage facilities are constantly being added to improve service in heavily populated areas.

Phenomenal growth of the L.P.G. industry is best illustrated by a comparison of last year's sales with those of 1922, first year for which figures are available. Marketed production

has risen from 223,000 gal. to more than 5,000,000,000 gal. in 32 years.

Although the percentage increase in domestic sales has leveled off in recent years, most of the volume increase has occurred in the past 10 years. Sales have increased fourfold since 1945, when the total was 1,276,766,000 gal.

Domestic and motor fuel . . . Biggest L.P.G. market is for domestic and motor-fuel use. Sales in this category rose 9.2 per cent in 1954 and accounted for 3,250,000,000 of the slightly more than 5,000,000,000 gal. sold. The gain might have been much greater if last winter had not been unusually mild.

Summer sales were down last year, and this decline is attributed largely to the prolonged drouth. Sales of L.P.G. for use in tractors were abnormally low.

Offsetting this decline is the increasing demand in other fields where L.P.G. is just now getting a toe hold. There has been a substantial use of L.P.G., for example, in curing tobacco. Portable plants for crop dehydration provide a relatively small but important market for L.P.G.

On the industrial front, several big companies have converted to L.P.G.-powered lift trucks. This transition is due largely to the elimination of exhaust fumes resulting from use of L.P.G.

In agriculture, growing markets are created by the trend toward more irrigation. It is estimated that approximately 80 per cent of farm machinery in the Lower Rio Grande Valley of Texas will be powered by L.P.G. by 1957.

On the nation's highways, L.P.G. service stations are becoming a more familiar sight, providing an incentive for use of propane or butane in refrigerated trucks and other vehicles.

Industrial and miscellaneous . . . Sales of L.P.G. for industrial and miscellaneous use showed a modest gain of 2 per cent last year, according to the Phillips survey. This compares with a gain of only 1.04 per cent during the preceding year, however.

Total L.P.G. sold for industrial and miscellaneous uses in 1954 is estimated at 382,000,000 gal. This is the highest total in history of the industry and is nearly double the amount sold for such purposes 12 years ago.

Because of extensions and increased volume throughput of natural-gas pipelines, industrial use of L.P.G. was believed to be off slightly during 1954. However, the increase in miscellaneous applications more than offset the apparent drop in industrial usage.

Three uses of butane and propane offer hope for greater industrial sales in the future. They include growing use of L.P.G. in standby plants as a protection against interrupted gas service, use in gas-turbine locomotives, and injection of L.P.G. in "flooding" oil sands to increase production.

Utility use . . . Mild weather and growing competition from natural gas also are blamed for the continuing slump in utility use of L.P.G. during 1954.

Sales for utility use or gas manufacturing totaled an estimated 208,000,000 gal. last year compared with 222,430,000 gal. in 1953. The decline in 1954 amounted to an estimated 6.5 per cent whereas the 1953 drop was 14.4 per cent.

Utility use of L.P.G., according to the year-end estimate, was at its lowest point since 1947. Peak sales for such

Here Is How L.P.G. Sales Have Grown

(Thousands of gallons)

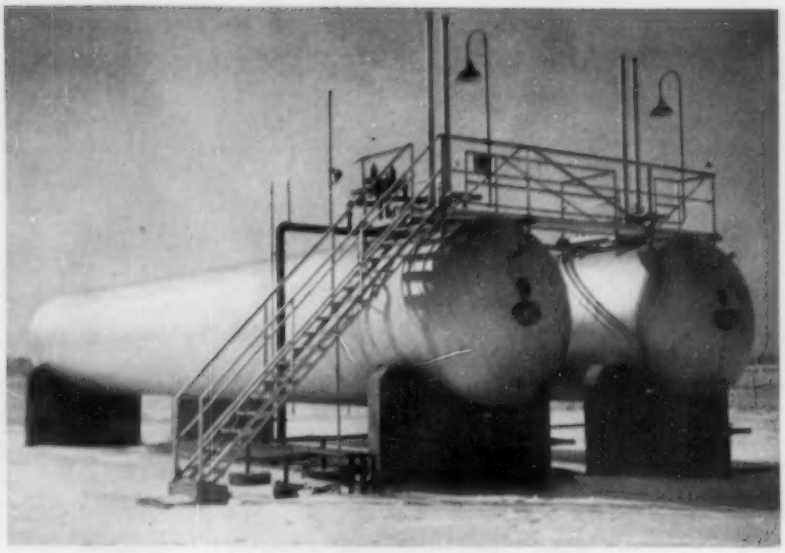
Year	Total sales	Domestic and motor fuel*	Industrial misc.†	Gas mfg.	Chemical mfg.	Rubber components
1922	223	Sale of liquefied petroleum gas confined primarily to bottled gas business prior to 1928				
1923	277					
1924	376					
1925	404					
1926	465					
1927	1,091					
1928	4,523	2,600	400	1,500		
1929	9,931	5,900	1,500	2,500		
1930	18,017	11,800	2,200	4,000		
1931	28,770	15,295	7,172	6,303		
1932	34,115	16,244	8,167	9,703		
1933	38,931	16,626	13,987	8,318		
1934	56,427	17,681	32,448	6,298		
1935	76,855	21,380	47,894	7,581		
1936	106,652	30,014	67,267	9,371		
1937	141,400	40,823	62,610	11,175	26,792	
1938	165,201	57,832	62,694	12,386	32,299	
1939	223,580	87,530	93,723	15,435	26,892	
1940	313,456	134,018	124,482	20,285	34,671	
1941	462,852	220,722	172,669	25,255	44,206	
1942	585,440	303,857	197,179	31,366	53,038	
1943	675,233	344,962	237,396	37,519	55,356	
1944	1,060,156	445,617	254,590	45,879	151,985	162,085
1945	1,276,766	533,262	256,577	53,849	224,291	208,787
1946	1,704,262	758,466	253,745	86,660	311,499	293,892
1947	2,209,797	1,150,538	274,125	169,332	414,267	201,535
1948	2,736,801	1,473,289	275,883	237,638	524,350	225,641
1949	2,836,599	1,627,550	247,103	239,210	544,886	177,850
1950	3,482,567	2,022,464	355,456	251,694	624,468	228,485
1951	4,227,275	2,456,804	269,408	281,692	844,507	374,864
1952	4,477,379	2,636,736	338,959	259,697	870,990	370,997
1953	4,932,009	2,977,418	374,233	222,430	967,427	390,501
1954	5,134,000	3,250,000	382,000	208,000	977,000	317,000

*Household use plus other requirements by these customers such as irrigation pumping, tractor fuel, flame weeding, chicken brooding and similar uses. Included also is L.P.G. sold by domestic distributors but used for industrial purposes. Included also, in years following 1950, is L.P.G. sold direct by producers and marketers solely for fueling internal combustion engines.

†For all years prior to 1951, include L.P.G. sold for refueling internal combustion engines.

In this table total sales for all years except 1954 were obtained from U. S. Bureau of Mines reports. Distribution for the years 1931 to 1953, inclusive, was obtained from the same source. All other volumes were estimated by Phillips Petroleum. The total sales volume includes all L.P.G. (propane, butane, and propane-butane mixtures) when sold as such. Until 1944 the sale of pentane when sold for any purpose other than motor fuel blending was included. Since then it has been excluded. It does not include butane when blended with heavier petroleum fractions for motor gasoline purposes. Inter-company sales transactions such as purchases of L.P.G. by one company from other companies and resold as L.P.G. have been eliminated in order to avoid duplication of sales figures.

A direct comparison of 1954 L.P.G. sales with those of 1953 reported by the Bureau of Mines, indicates a substantial decrease for 1954. However, the Bureau of Mines changed the method of reporting statistics starting January 1, 1954. This change in reporting procedure makes such a direct comparison of sales for these two years unrealistic. The two major changes were: L.P.G. blended into gasoline were reported by gasoline plants (shipper) in 1953, but in 1954 they were reported by refineries (receivers). These reports showed more L.P.G. being blended into gasoline, leaving less for "other uses." It is necessary to consider this change when making a comparison. The reports for 1954 contain more complete coverage of L.P.G. in underground storage. This is an important change, since that which is not reported as in storage is shown as sales. It is felt that the revision makes the entire report more accurate and realistic, although it does not show a breakdown of demand for the various uses.



TYPICAL L.P.G. "peak shaving" installation to supplement heavy gas loads.

purpose were in 1951, when the total reached 281,692,000 gal.

Counteracting the downward trend is the demand for L.P.G. for peak shaving by utilities extending their home-heating markets and the use of L.P.G. "in the mains" at new housing developments in some sections of the country.

Chemical manufacture . . . Sales of L.P.G. as a raw material for manufacture of chemicals and chemical intermediates rose to an estimated 977,000,000 gal. in 1954 for a gain of 1 per cent. The modest increase was caused by an upturn in demand during the last quarter of the year, the Phillips report indicates.

"Petrochemicals, as a group, made a much greater gain during the year," the report continues, "but most of the gain was due to increased use of methane and ethane in the production of anhydrous ammonia and polyethylene."

Demand was slow for petrochemicals used in the textile industry and for various antifreeze compounds, both of which require large volumes of L.P.G. Requirements for new plants and full-time operation of plants built in 1953 barely compensated for the decreased demand in other petrochemical plants.

Rubber . . . Biggest drop was in L.P.G. used as a raw material in the manufacture of synthetic-rubber components. Sales in this category totaled an estimated 317,000,000 gal. in 1954 for a drop of 18.7 per cent from the 1953 total.

The drop was attributed largely to the substantial cutback in synthetic-rubber production authorized by the Federal Facilities Corporation. Also contributing to the decline, indirectly at least, is the high rate of automobile manufacturing in 1952 and 1953 which has resulted in an unusually large number of new cars on the road. Many of these cars are still running on their original rubber, thereby reducing the demand for replacement tires.

Other factors involved are the increased tire mileage attained through improved synthetic rubbers and better carbon blacks, greater use of natural rubber, and reduction in new-car tire demands as a result of cutbacks in automobile production as the industry prepared for introduction of new models.

Supply . . . Production capacity is available to meet greatly increased demands for L.P.G.

Twenty new L.P.G. plants were either completed in 1954 or nearing completion at the end of the year. They included 19 natural-gasoline plants and one major refinery addition. Their production capacity is placed at 700,000,000 gal. a year.

It is estimated that 15 new plants with a production capacity of at least 200,000,000 gal. per year will be added during 1955.

The Phillips survey places total underground storage used for L.P.G. at 458,400,000 gal. as of January 1 as compared with 246,000,000 gal. a year earlier. The year-end total represents a gain of about 86 per cent during 1954.

In addition, underground storage facilities now under construction would provide for 140,500,000 gal. as compared with facilities for 109,700,000 gal. under construction January 1, 1954. New underground storage proposed would have an additional capacity of 109,400,000 gal., bringing total capacity of such facilities in use, under construction, and proposed to 708,300,000 gal. The comparable figure a year earlier was only 475,600,000 gal.

Lower construction costs have encouraged big underground storage facilities in the Permian basin salt beds extending from Kansas through the Oklahoma and Texas Panhandles and across West Texas and southern New Mexico. Some storage space also is used in sand formations underlying many producing facilities, and large volumes of L.P.G. are stored in salt domes along the Gulf Coast.

In the northeast, development of underground storage space has been slow. In recent months, however, construction has started on underground storage facilities at refineries and terminals along the East Coast.

Underground storage space in use in the northeast section of the country has a capacity of approximately 34,000,000 gal. The trend toward greater storage of L.P.G. in the northeast is expected to receive added impetus during 1955, although the underground storage foreseen for that area still represents less than 10 per cent of the total.

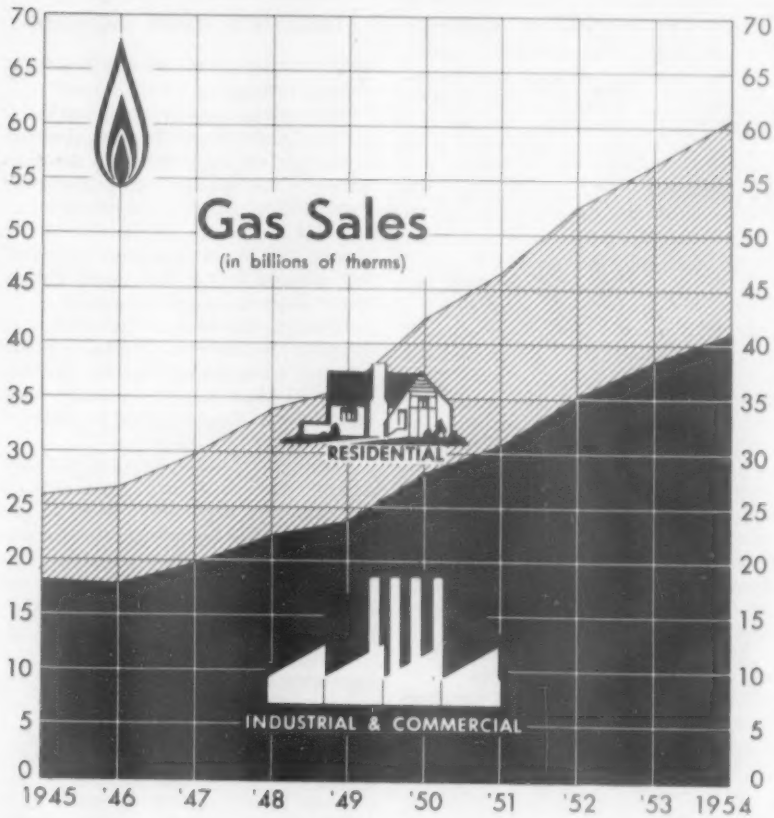
Transportation facilities also are expanding, as is indicated by the addition of more than 2,100 tank cars to the L.P.G. fleet during 1954. The nation now has 26,144 pressure tank cars suitable for L.P.G., although about 7,500 of them are in other service.

One sea-going barge christened during 1954 makes a total water fleet of two L.P.G. ships, three dual cargo ships, four propane barges, and one butane barge. In addition, new L.P.G. pipelines have been announced for Mexico, Canada, and the United States, and movement of L.P.G. by truck is increasing.

Role of Government . . . Like most of the petroleum industry, the L.P.G. business has a mild case of the New Year's shakes as result of the Government's recently proclaimed controls over natural gas.

Any regulation which has an adverse effect on the production and marketing of one petroleum product will tend to increase the cost and decrease the supply of other petroleum products, the Phillips officials warn.

"A natural-gas price artificially depressed by regulatory forces, which may well occur in many areas during the first several years under regulation, will place the LP-Gas marketer at a competitive disadvantage." And, perhaps worse, warn the authors, such control will lead directly or indirectly to regulation of other petroleum products.



Gas Industry Expanding

Natural gas chalks up another record year, looks to 1955 for new high points as expansion expenditures continue

NEW YORK.—The gas industry in the United States will spend $3 billion before the end of 1957—the major part of it in natural-gas facilities—to expand an industry which set more new records in 1955.

Presenting his year-end report last week, F. M. Banks, president of the American Gas Association, said gas-utility and pipeline companies set new 1954 records in the number of customers served, in volume of gas sold, and in revenues. He predicted the industry will set more new records in 1955.

Banks, president of Southern California Gas Co., Los Angeles, said utility and pipeline companies spent more than $1 billion for construction of new facilities and expansion in 1954 and expect to spend at least that much during 1955. He estimated expenditures of $4 billion for the 1954 to 1957 period.

Natural gas gains . . . Last year, the natural-gas industry added more than 17,500 miles of new gathering, transmission, and distribution lines to its systems. This brings the total mileage in natural-gas pipelines in this country to about 413,000 miles.

Natural gas was serving more than 22 million customers at the end of 1954, a gain of 5.2 per cent over last year. It accounted for more than 95 per cent of all gas sales in the United States, and furnished about 25 per cent of the energy requirements in this country. Sales of natural gas reached 57,440,000,000 therms last year, a gain of 8 per cent over the previous year, and natural-gas revenues increased 13 per cent to total $2,544,000,000.

New pipelines . . . The Federal Power Commission in 1954 granted temporary certification to the American-Louisiana Pipeline Co. for a 1,200-mile, 30-in. line from Texas to Michigan at a cost of about $130 million.

Full FPC approval has been granted Pacific Northwest Pipeline Co. for a 1,800-mile line to transport gas from the San Juan basin of Colorado and New Mexico to the populous Pacific Northwest. Since then Pacific Northwest, Westcoast Transmission Co., Ltd., and El Paso Natural Gas Co. signed a three-way deal to supplement this gas movement with the southward transmission of Peace River gas from Canadian fields. An alternate line will furnish additional northern California markets with gas *(The Oil and Gas Journal, December 20, 1954, page 58)*.

Before the end of 1954, Coastal Transmission Corp., a new Clint Murchison enterprise, revealed plans for 400-mile, 30-in. transmission line from the Rio Grande Valley to Beaumont. It could easily be used for the movement of gas from Mexican fields northward *(The Oil and Gas Journal, December 27, 1954, page 108)*.

Reserves . . . Proved reserves of natural gas in 1954 totaled 211.4 trillion cubic feet, a gain of 11.7 trillion cubic feet. This gain was made in spite of record production of 9.2 trillion cubic feet during 1953.

The A. G. A. president emphasized last week that the reserve estimates included only proved recoverable reserves. They do not include to their fullest potential the reserves in new areas now being developed.

The future . . . The A.G.A. estimates that over-all sales by gas utilities will

Gas Line Revenues Up

WASHINGTON.—Operating revenues of natural-gas pipeline companies operating under Federal Power Commission regulations are more than $1,500,000,000 a year.

The FPC says the 35 companies under its regulation had operating revenues of $1,663,028,000 during the 12 months ending in October, compared with $1,361,932,000 for the same period a year earlier.

While operating revenues increased 14.8 per cent, net income increased only 10.9 per cent, to $165,704,918 from $149,439,780. The lower net was due to sharp increases in payments for purchased gas, storage, and distribution expenses, and income deductions for interest and amortization of debt, etc.

Here's How Natural Gas Fared in 1954

	1954	1953	Per cent change
Customers (average)			
Residential	19,732,000	18,386,200	7.3
Commercial	1,594,000	1,476,700	7.9
Industrial	80,000	73,600	8.7
Other	25,000	22,700	
Total	21,431,000	19,959,200	7.4
Sales (thousands of therms*)			
Residential	17,486,700	16,017,800	9.2
Commercial	4,991,800	4,486,900	11.3
Industrial	32,132,800	29,671,000	8.3
Other	2,830,100	3,018,600	
Total	57,441,400	53,194,300	8.0

*A therm is 100,000 B.t.u. or the heat equivalent of 100 cu. ft. of natural gas.

total nearly 75 billion therms in 1957. Househeating is expected to make great strides. Anticipated space hearing requirements in 1957 will be about 53 per cent higher than those of 1953.

To meet the increased demands for service, A.G.A. says, the industry will need 4.6 million tons of steel pipe between now and 1957. Of this, 2.9 million tons will be 16-in. or larger and used in natural-gas transmission lines.

Natural gas is will continue to grow in contrast to manufactured gas, which last year accounted for only 5 per cent of gas sales. While natural gas last year showed marked gains, manufactured gas use dropped off or chalked up only small fractions of natural-gas increases.

Manufactured gas lost 9 per cent of its customers in 1954, compared to 1953, showed a sales gain of less than 1 per cent, and a revenue gain of only 0.1 per cent over 1953.

Students Work Under Field Conditions

Petroleum engineering students at Texas Tech get practical experience on a late-model Emsco oil-well pumping unit. The unit has been loaned to the college indefinitely for display and instructional purposes by Continental Supply Co., Dallas. It enables students to learn, under field conditions, desirable speeds of operation, pump sizes, sucker-rod loading, and counterbalancing.

Imports, Exports Up

Crude receipts drop, but resid fuel takes big jump

TULSA.—Imports increased 3.3 per cent in October.

The seasonal gain in imports of residual fuel more than offset the decrease in receipts of crude to bring the total to 1,017,700 bbl. daily compared with 984,200 bbl. daily in September and 981,800 bbl. daily in October 1953. Import and export data are compiled and released by the Bureau of Census of the Department of Commerce.

Imports of residual fuel averaged 360,000 bbl. daily in October, up 8.5 per cent from the average for October 1953. Residual imports reached a peak last winter in January when the average was 490,000 bbl. daily.

Crude and product exports averaged 318,000 bbl. daily for a gain of 20.9 per cent over September. Most of the gain was due to higher exports of crude following the very low average for September. Increases were also reported for gasoline, distillate fuel, and lubricants.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	Oct. 1954	Sept. 1954	Oct. 1953
Crude—			
Mexico	480	587	379
Colombia	704	900	1,337
Venezuela	9,439	11,245	11,676
Peru	(†)	125	
Ecuador	(†)	110	90
Kuwait	3,276	3,056	3,050
Saudi Arabia	2,445	2,448	895
Iraq	(†)	391	92
Qatar	(†)	130	700
Canada	73	67	342
Far East	(†)	994	1,030
Other	2,034		
Total crude	18,451	20,053	19,591
Daily average	595	668	632
Products—			
Residual fuel	11,161	8,371	10,286
Other products	1,937	1,103	559
Total products	13,098	9,474	10,845
Daily average	423	316	350
Total all oils	31,549	29,527	30,436
Daily average	1,018	984	982

EXPORTS*

	Oct. 1954	Sept. 1954	Oct. 1953
Crude	1,485	509	1,178
Gasoline	2,529	2,265	1,946
Kerosine	187	250	303
Distillate	2,156	1,525	2,353
Residual	1,297	1,565	2,022
Lube oils	1,188	973	1,197
Other products	1,015	792	779
Total all oils	9,857	7,879	9,778
Daily average	318	263	315

*Excludes shipments to territories. †Included in other.

T.G.T. Enters N.Y.

Agreement with Transco receives FPC approval

WASHINGTON. — Tennessee Gas Transmission Co. has broken into the New York metropolitan area with Federal Power Commission authority to build a 243-mile, 24-in. line from Hebron storage field in Potter County, Pennsylvania, to existing facilities near Greenwich, Conn.

T.G.T. also received FPC blessing for development with Iroquois Gas Corp. of an underground storage field at Colden, N. Y., and with New York State Natural Gas Corp. for an underground field at Harrison in northern Pennsylvania.

The approval represents T.G.T.'s first entry into the New York-New Jersey area, the world's largest natural-gas market. Transcontinental Gas Pipe Line Corp. and Texas Eastern Transmission Corp. have previously supplied all the natural gas to customer companies in the area.

Transcontinental now sells gas to six firms in the market area and T.G.T. has tried many times to gain an entry. The two firms finally decided October 14 that a compromise could be worked out under which they would share the market.

The compromise . . . Under terms of the compromise, T.G.T. will sell 75,000 M.c.f. of gas daily to four customers. Brooklyn Union Gas Co. will buy 20,000 M.c.f.; Consolidated Edison Co. of New York, 25,000 M.c.f.; Public Service Electric & Gas Co., of Newark, 25,000 M.c.f.; and Long Island Lighting Co., of Mineola, N. Y., 5,000 M.c.f.

Transco's additional share will include Brooklyn Borough Gas Co., 1,000 M.c.f.; Brooklyn Union, 5,000 M.c.f.; Consolidated Edison, 5,000 M.c.f.; Kings County Lighting Co., of Brooklyn, 500 M.c.f.; and Public Service Electric, 25,000 M.c.f.

The largest of the projects moneywise approved by the FPC is a $29,700,000 looping of Transco's line between Texas and New York. The project calls for 173 miles of 30 and 36-in. line and 58 miles of 12 and 16-in. lines plus additional compressor capacity.

In addition to its 243-mile line, T.G.T. will build the 10-billion-cubic-foot storage field at Colden with Iroquois and a 19-billion-cubic-foot storage unit at Harrison with New York Natural. These two fields plus the existing Hebron field will enable T.G.T. to deliver 770,000 M.c.f. to the New York-New Jersey-New England area for 100 consecutive days, if the need should ever arise.

Dresser, Lane-Wells to Merge

LOS ANGELES. — Lane-Wells Co., one of the oil industry's leading service and supply companies, will merge with mammoth Dresser Industries, Inc., if Lane-Wells stockholders approve the action taken last week by their board of directors.

Rodney S. Durkee, Lane-Wells board chairman, disclosed here last week that the directors voted to accept an offer made by Dresser to exchange 576,000 shares of Dresser common stock for all the assets of Lane-Wells.

Lane-Wells stockholders will receive four shares of Dresser common for each five shares of Lane-Wells they now hold. Durkee said a special stockholders meeting will be held in the near future to approve the action of the board.

Lane-Wells operates through three divisions and two foreign subsidiaries and has more than 100 branches in the oil fields of the United States, Canada, and Venezuela. Well Surveys, Inc., a wholly-owned Lane-Wells subsidiary, pioneered the development of radioactivity logging and now licenses the service. The research subsidiary is also engaged in electronic research and the development of new instruments for well logging.

H. N. Mallon, Dresser president, said last week he was "delighted" to learn of the Lane-Wells board approval of the merger plan. He said he regards Lane-Wells as a "most valuable addition to the Dresser group of companies." Lane-Wells management will continue in full operating control of the company as in the past, Mallon said.

The merger will greatly expand already diverse oil industry interests of Dresser Industries. Dresser now furnishes drilling equipment to the industry through its subsidiary, Ideco. Clark Bros. Co. manufactures engines and compressors for repressuring gas fields, for gas pipelines, and for refineries.

Another Dresser company, Pacific Pumps, Inc., makes pumps and similar equipment; a Dresser mining and milling operation, Magnet Cove Barium Corp., offers drilling mud and chemical service; and Security Engineering Division manufactures drilling bits.

Landmen Organize

New national association plans convention in April

AMARILLO, Tex.—Professional landmen in the oil industry are organizing a national society, the American Association of Petroleum Landmen.

Landmen feel the new association will make constructive contributions to the industry and in addition secure better recognition for their profession. Landmen have been the only professional or semiprofessional group in the industry without a national organization. They were considered eligible for membership in the National Oil Scouts and Landmen's Association, but their role in this society was a minor one, largely because of the different interests of the scouts and landmen.

Last April a group met at Denver to lay plans for the national organization. George F. Brown, Sun Oil Co., Amarillo, was appointed chairman of a committee that was to work out the details. The original seven-man committee grew to its present 34 members. All 34 men hold responsible positions in the oil industry and most are either the president of local landmen's associations or have held that post. Twenty-two different local societies are represented on the committee to insure industry-wide representation.

At a meeting in Oklahoma City in November, the committee adopted the name and agreed on a constitution that will be presented for approval at the first national convention in Fort Worth in April.

Temporary headquarters for the association have been set up at Amarillo. Inquiries should be addressed to the A.A.P.L., P.O. Box 46, Amarillo.

Sinclair to Add CO Boiler

EAST CHICAGO, Ind.—A carbon monoxide boiler which permits recovery of additional energy in the form of steam has proved so successful at Sinclair Refining Co.'s Houston refinery that the company will add one at its refinery here.

The CO boiler, which produces the steam from further burning of regenerator effluent gas, may add to the capacity of the 34,000-bbl. fluid-catalytic cracker here, but will not add to the refinery's crude capacity.

The project also includes expansion and revision of the hydrocarbon gas-recovery facilities and is aimed at increasing operating efficiency.

The additions will cost more than $3 million. Sinclair has already received a tax write-off from the Government of 60 per cent of $2,225,405 and 50 per cent of $99,595.

Water shut out by . . .

New Explosive Cementing Tool

Welex offers new blasting variation on squeeze cementing to seal off unwanted perforations or porous formations

Robert J. Enright

ARLINGTON, Tex. — A new tool which virtually explodes cement into perforations or a porous formation is rapidly gaining popularity in oil-producing areas east of the Rockies.

A radical departure from conventional squeeze-cementing equipment, the tool has an over-all length of about 33 ft. It consists basically of a firing mechanism and powder charge, a 30-in. rubber packer, and a cement container. It is run on the end of a wire line and discharged electrically from the surface.

The tool has proved most valuable in conquering water problems such as squeezing perforations or any part of a set of perforations and in rectifying leaky shoes or bridge plugs.

The technique and equipment are available to the industry on a fee basis through a new service offered by Welex Jet Services, Inc., Fort Worth, in all areas where the company operates.

One satisfied user says the technique saved his firm $1,000 to $1,500 per job, compared to conventional squeeze-cementing methods.

The service is only slightly cheaper than for a conventional squeeze cement. Savings to the operator, however, are considerably greater than appear on the surface because of savings in cement and rig time as well as other factors. Users of the technique also are better able to pinpoint the cement and face less danger of sticking equipment in the hole. Another advantage is that an operator using the tool can squeeze without fluid in the hole.

How it works . . . In squeezing perforations, the cementing tool is run in the hole on a wire line to the desired level and detonated. Electrical current transmitted through the wire line sets off a squib cap on the bottom of the gun which in turn ignites the main powder charge.

The firing mechanism or gun recoils about 1½ in. forming a metal-to-metal seal between the gun and gun holder and closing a small port. Gases from the explosion continue to expand forcing the rubber packer to expand against the casing. Gas expansion shears a pin attaching an aluminum nose to the bottom of the cement container and forces the cement from the tool.

When the energy from the explosion is dispelled, the gun returns to its original position, opening the port, allowing the well fluid to pass, and relieving the rubber pack-off.

The tool is withdrawn, leaving only cement, the aluminum nose, and a 1-in. aluminum gun seal in the hole. The cement generally sets in 1½ to 2 hours depending on bottom-hole temperature. A check on cement-setting time is kept on a sample of the slurry at the surface.

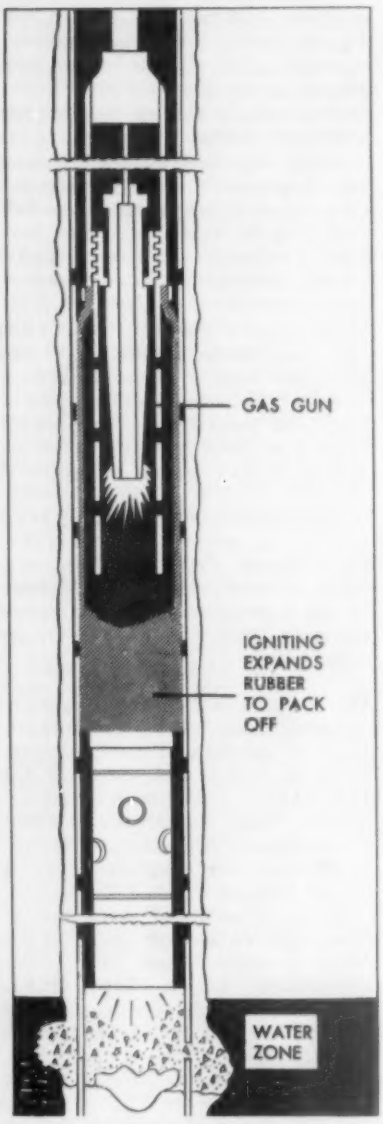
When the cement has set, the tool is rerun and the cement level checked by a weight indicator mounted on the service truck, which records a sharply reduced weight when the tool contacts the cement. If the perforations are not covered, the tool is reloaded and rerun and the process repeated.

A bridge plug is ordinarily used below the perforations, but if they are near the bottom it sometimes is more economical and otherwise desirable to plug back with pea gravel.

The tool performs best when there are at least 8 to 10 perforations in the zone to be squeezed. The force and split-second nature of the explosion dictate that there be an ample outlet for cement emerging under the high instantaneous pressure.

If fluid is entering the hole, its level must be allowed to become static before the cementing operation begins to prevent incoming fluid from agitating the setting cement. This can be done by either letting the hole load up with fluid until it finds its own static level or by injecting fluid from the top. It is considered even better to overload with fluid to make sure that none is entering the hole.

Open-hole procedure . . . Squeezing off bottom-hole water is exactly the same except that the bridge plug or pea gravel may be eliminated. The tool's rubber packer reportedly performs as effectively in open hole as in casing up to certain bore-hole diameters. These hole-size limitations range from an 8⅞-in. hole for a 4⅝-in. diameter tool to a 7-in. hole for the smallest 3½-in. tool. In addition to these sizes, tools are available with diameters of 5 in. and 4¼ in.



Welex does not recommend that the tool be employed in holes previously shot with nitro, but in many cases has used it in those treated with acid.

Gas-well application . . . The technique also has proved efficient in various cementing operations in gas wells.

Well fluid is not required since the tool performs just as well in a dry hole. If the gas well is attempting to flow, a pack-off head is installed at the surface to prevent gas from escaping and to equalize pressure in the casing. Otherwise procedure is the same.

In addition to not requiring well fluid, the new explosion technique boasts these advantages over conventional squeeze cementing operations:

. . . **Cement is placed** more effectively. Jobs can be handled calling for from 2 to 50 ft. of cement in the hole.

. . . **Less cement is required.** Two or three sacks may do the job where 50 or 60 or more may be needed in a conventional operation.

. . . **Rig time and labor requirements** are cut substantially. A cable-tool rig or even a well-servicing unit can be used to run the tool in and out of the hole.

. . . **Danger of encurring** a fishing job during the cementing operation is lessened since the tool's packer releases readily.

. . . **Packer can be set** in open hole, over perforations, or in blank casing.

The cementing tool is assembled and loaded at the well location, with the powder charge and volume and composition of cement slurry varied according to the job to be done.

Cement capacity of the tool ranges from about 1½ sacks for the smallest container to about 3 sacks for the largest.

The powder charge varies from 1½ to 3 ounces and averages 2½ to 3 ounces. A small charge usually is used if a squeeze job is called for on a leaky bridge plug.

Field performance . . . Three typical case histories selected at random from the large number of jobs performed so far illustrate the technique's efficiency in shutting off undesirable water in different situations.

In TXL Notrees field of Ector County, West Texas, the technique was used to seal off bottom-hole water in an Ellenburger oil well completed in open hole at a total depth of 9,762 ft. The well was producing 165 bbl. of oil and 14 bbl. of water daily.

Fluid level during the squeeze was static at 1,700 ft. Four sacks of Type V cement plus 2 per cent calcium chloride was squeezed into the hole in three trips with slurry weights ranging from 16.7 to 17 lb. per gallon. Roughly 60 per cent of the slurry was squeezed into the formation and the hole cemented back 14 ft. to 9,748 ft. After the squeeze, the well produced 177 bbl. of oil daily with .1 per cent b.s. and w.

A more spectacular production reaction resulted in a well producing oil from the Gardiner sand of Cree Sykes field, Runnels County, West Central Texas.

Here, the lower of two sets of perforations had gone to water. The operator wished to squeeze off the lower set, totaling 12 ft., and eliminate any possibility of water channeling behind the 5½-in. casing to the upper set of perforations.

Total depth of the hole, which was filled with oil and water, was 3,912 ft. The tool was set at 3,902 ft. and one sack of high-early-strength cement mixed to a 15½-lb.-per-gallon slurry was exploded into the perforations. Top of the cement following this trip was logged at 3,908 ft. Another run using the same amount of the slurry brought top of the cement to 3,897 ft. The undesirable perforations were squeezed off using only 2 sacks of cement, of which roughly 30 per cent was displaced through the perforations.

Production of the well, 119 bbl. of oil and 21 bbl. of water before the squeeze job, increased to 189 bbl. of oil and no water.

A gas well completed in Fruitland coal and shale section at a total depth of 2,590 ft. in Ignacio field of southwestern Colorado responded equally well.

This well was completed in open hole and was making 20 bbl. daily of bottom-hole water.

The hole was plugged back with pea gravel to 2,554 ft. to insure that the cement would be placed far enough up the hole to shut off the water. The job was performed with no fluid in the hole.

The tool was run 6 times on this job employing 11½ sacks of high-early-strength Type III cement with slurry weights ranging from 14.5 to 16 lb. per gallon. Roughly 73 per cent of the slurry was displaced into the formation and the hole filled 17 ft. to 2,537 ft.

Water coming into the hole was squeezed off with no adverse effect on gas production.

Petrochem Plant Planned

NEW YORK.—Simpson Coal & Chemical Corp. will build a major petrochemical plant at Natchez, Mississippi.

The basic plant will convert natural-gas fractions to acetylene, producing about 30,000 tons per year. Part of the acetylene will be used for an integrated vinyl chloride monomer and polymer installation. By-product hydrogen from the acetylene process will be utilized in the production of about 60,000 tons of synthetic anhydrous ammonia per year, or about 165 tons per day. The company will use a variation of the Sachse process to make acetylene.

According to David W. Wollin, Simpson's vice president in charge of operations, a plant site and natural gas supplies have been secured. Simpson, a subsidiary of Standard Ore & Alloys Corp., has headquarters in New York City.

Industry Briefs

HOUSTON.—Merger of Red Bank Oil Co., New York, and Seatex Oil Co., Inc., Houston, was announced last week. The consolidated company has acquired controlling interest in Allied Oil & Gas Corp.

SCOTTSBLUFF, Neb.—Sinclair Oil & Gas Co.'s district land and geology department, located here since 1951, has been moved to Denver. Sinclair officials said increased oil activity in central and eastern Colorado prompted the move. The company will continue to develop its Nebraska leases. It has wells in the Torgeson and Allely pools of Kimball County, Nebraska.

NEW YORK.—The Asphalt Institute will move its offices and laboratories to the campus of the University of Maryland so its research and engineering operations can be expanded. J. E. Buchanan, Institute president, said the shift to College Park, near the outskirts of Washington, D. C., will result in more efficiency in research and development as well as make the headquarters more accessible to government agencies.

NEW YORK.—Socony-Vacuum Oil Co. will fuel the first turboprop airliners to be placed in commercial service between New York and Montreal in February. Contract for jet fuel was awarded Socony-Vacuum by Trans-Canada Air Lines. It calls for delivery of 2,500,000 gal. of the fuel in 1955 and 3,000,000 gal. in 1956 and 1957.

BAY CITY, Mich.—Bay Refining Corp. has placed its "packaged" 6,000-bbl. per day Thermofor catalytic cracker on stream at its 10,500-bbl. refinery here. The unit, which cost $3,000,000, was licensed by Socony-Vacuum Oil Co., Inc., and built by Southwestern Engineering Co., Los Angeles.

DALLAS.—Oil & Gas Property Management, Inc., Dallas, has purchased interests in 17 wells in Carthage field, Panola County, Texas. The purchase was made from Lyons, McCord, Logan, et al., Shreveport, La. The deal involved about $2,250,000.

SAN FRANCISCO.—More than $127,000,000 will be spent by Tide Water Associated Oil Co. in its 1955 expansion and development program. A major part of the sum, largest ever budgeted by the company for a single year's capital outlay, will be spent in construction of a 130,000-bbl. per day refinery on the eastern seaboard.

Wax Plant on Stream

BAYONNE, N. J.—A bauxite-filtration plant with a capacity for treating 400 tons of wax daily has gone on stream at Esso Standard Oil Co.'s refinery here.

The new facility, which consists of eight 8-ton filters and a roaster for clay revivification, is the latest addition to the Bayonne wax operation, which has been completely modernized during the past 5 years.

Esso can now filter four grades of wax at once, including trade scale. The four filters employed previously could only handle one grade at a time and could not handle trade scale.

The remodernization of wax facilities at Bayonne was begun with the addition of a 6,300-bbl. per day methylethylketone plant. The unit, which has been in operation since May 1950, can produce 178 million pounds of wax annually and has replaced the traditional manual wax making operation in use for decades at the 75-year-old refinery.

Boomlet Hits California

LOS ANGELES.—A drilling spree is developing as result of a potential oil discovery in Huntington Beach, Calif.

Jack Crawford et al 4 Huntington was completed in the 5,000-5,300-ft. Miocene sand and flowed at a rate of 28 bbl. per hour through 5/64-in. choke. Before reaching its objective in the Miocene, however, it encountered the Jones sand at 3,825-4,000 ft. and thereby may have opened a new fault-block pool. It was this pay which touched off the drilling boom at Huntington Beach in 1926.

Following completion of 4 Huntington, Crawford started 5 Huntington with the Jones as its objective.

More than 15 new drilling permits have been issude by the City Council to Standard Oil Co. of California, Southern California Petroleum Corp., Holly Development Corp., Atlantic Oil Co., Beloil Corp., and other operators. Several houses were being moved to make sites available for drilling.

S.A.E. to Hear Fuels Report

DETROIT.—Current trends in development of fuels and lubricants will be among the principal topics of discussion by the Society of Automotive Engineers at its golden anniversary meeting here January 10-14.

Among the well known speakers will be Dr. C. F. Kettering, of General Motors Corp., who will give a general report on the automotive industry. T. A. Boyd, also of General Motors, will discuss fuels and lubricants, and A. L. Klein, California Institute of Technology, will discuss aircraft engineering.

Round-table discussions will center on such topics as 1955 automobile engines, turbine-power plants, and air pollution. The session will be the first of 11 meetings scheduled by S.A.E. for 1955 in celebration of the 50th anniversary of its founding.

Producing Wells Sold

LOS ANGELES.—Continental Production Co. has purchased 98 producing wells in Wilmington field from Continental Consolidated Corp. The wells are on the west berm of the Los Angeles County flood-control channel and drilled directionally under the city of Long Beach.

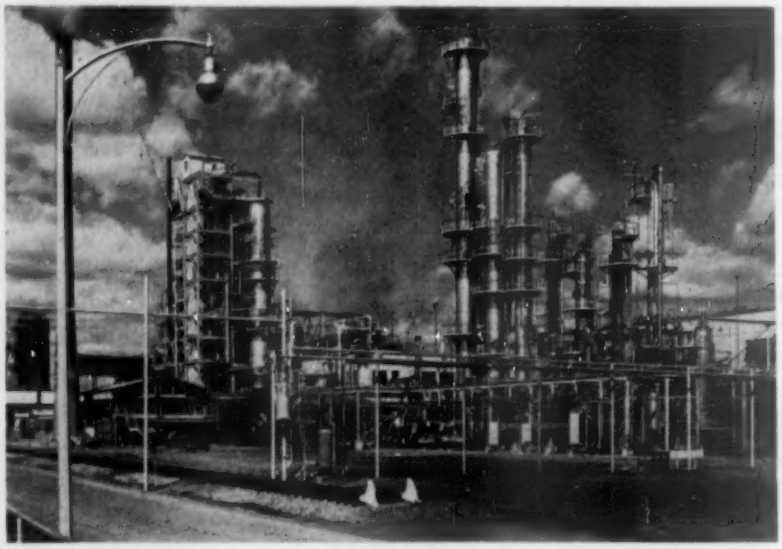
Continental Consolidated, former Phillips Petroleum Co. subsidiary, is being dissolved. Phillips is operator of the properties and will continue to operate the properties for Continental Production. E. C. Simmons is sole owner of Continental Production.

Analysis of Wells Finished

REGINA.—The Saskatchewan Department of Mineral Resources recently compiled a preliminary analysis of formation-water samples taken from wells drilled in the province.

The analysis were run in the chemical laboratory of the Petroleum and Natural Resources branch of the Department of Mineral Resources. They include the well name, location, geological zone from which the sample was taken, test interval, Kelly bushing elevation, resistivity, hydrogen, iron concentration, specific gravity, and chemical analyses.

The compilation is available at the Department of Mineral Resources office here.



Shell to Expand Refinery

MONTREAL EAST.—Shell Oil Co. of Canada, Ltd., will increase the capacity of its refinery here from 44,000 to 55,000 bbl. daily.

Dr. D. M. Morrison, vice president of manufacturing, said $4 million has been earmarked for the first step in the expansion. It will include a vacuum flasher and adding 3,500-bbl. capacity to a 16,500-bbl. fluid cat cracker.

Although no dates for the expansion have been announced, Arthur G. McKee Co. of Canada, Ltd., has been awarded the contract to build the vacuum flasher. Shell engineers will do the work on the cat cracker, which will be increased by installing a new furnace and an internal regenerator cooler.

Shell built the Montreal East plant in 1932 as a 5,000-bbl. per day refinery adding larger and more modern units as demand soared.

In 1950 a multimillion dollar expansion was completed which equipped the refinery with a cat cracker, new flashing unit, larger polymerization unit, new laboratories, maintenance shops, additions to the blending and distribution facilities, and 750,000 bbl. of tank storage.

Congressional Scene Set

Industry's attention will be centered on restrictions on imports, natural-gas control, and the depletion allowance

Bertram F. Linz

WASHINGTON.—Federal regulation of natural-gas producers, oil imports, and the depletion allowance are the issues of major interest to the oil and gas industry facing the new 84th Congress, which convenes Tuesday.

Other matters in which the industry has a stake—revision of the antitrust laws, modification of the Taft-Hartley Labor Relations Act, and reduction of the corporate income tax—will be debated at the Capitol, but attention will be focused on the big three.

The administration's views on these subjects will be made known soon, some of them in the President's annual State of the Union message which may go to Congress at the end of the week.

While Democratic control of Congress could result in the complete overhaul of the Republican administration's legislative proposals, most of Eisenhower's major programs are expected to receive Democratic support. The fact that much of the nation's oil and gas is produced in Democratic states and is consumed in both Republican and Democratic areas will do much to take political heat out of congressional consideration of industry problems.

Politics, however, will underlie the many proposed investigations, some of them involving oil and gas. Here, the effort will be to see what the administration has been doing in the natural resources field, with emphasis upon charges of "give-away" such as marked the controversy over return of their tidelands to the states in 1953.

Some of the highlights expected during the coming session are:

. . . **A vigorous drive** to amend Section 1 of the Natural Gas Act to take independent producers from the jurisdiction of the Federal Power Commission under which they were thrown by the Supreme Court in the Phillips case decision. The measure will encounter stiff opposition from the gas-consuming states, but has at least a 50-50 chance of enactment.

. . . **A renewed effort** to obtain restrictions on oil imports. This would be counter to the policy originated by a Democratic administration and adopted by the Republican leadership of eliminating restrictions on the international exchange of commodities, but top government officials concerned with oil matters are convinced that something must be done about the ever-increasing flow of foreign oil into domestic markets.

. . . **A recommendation** for a cut in the 27½ per cent depletion allowance is expected from the Treasury Department. This recommendation is expected to be turned down by Congress, which indicated in last year's tax legislation that it favors increasing rather than decreasing the incentive to explore for natural-resources reserves.

Other proposals . . . Extensions of the present 52 per cent rate of tax on corporate income will be recommended by the President and probably will be accepted by Congress without opposition. The tax was scheduled to be reduced to 47 per cent last April 1, but the cut was deferred for a year and Eisenhower is expected to ask its continuance for at least another year along with extension of the Korean-emergency increases in the gasoline and other taxes. But at the same time, he may suggest that tax relief be given American companies operating abroad as an incentive to increased foreign investment.

Substantial revision of the antitrust laws is less likely than it was a year ago, when the Republicans controlled Congress, but enactment of some of the recommendations to be made by a Justice Department study group is expected in an effort to eliminate confusion arising out of the many amendments to the original antitrust statutes.

No major changes are expected in the labor-relations act. In other labor action, Congress will probably endorse the administration's recommendation that the minimum-wage scale be raised from 75 cents to 90 cents or possibly $1 an hour.

The Interior Department's plan to open to oil exploration and development the 20,000,000-odd acres of northern Alaska lands adjacent to Naval Petroleum Reserve No. 4 will be laid before congressional committees for approval, but will not require legislation.

Legislation laying the groundwork for investigation of the problem of air pollution will be introduced, as well as bills providing tax or other incentives to industry to deal with the problem on an individual plant basis.

Congress also will be asked to extend the Defense Production Act and the Interstate Oil Compact. Along with these matters will be the annual appropriation bills for the operation of the Oil and Gas Division, Bureau of Mines, Geological Survey, Federal Power Commission, and other federal agencies.

Rubber Negotiations End

Deals for disposal of plants await approval of Congress; two plants still held by Government would be mothballed

WASHINGTON.—The Government's synthetic-rubber industry, with the exception of two copolymer (GR-S) plants, will pass into private ownership within the next few months if Congress approves a sales plan developed by the Rubber Facilities Disposal Commission.

The commission wound up its negotiations December 27 with the signing of contracts for sale of the 50,000-ton per year butyl plant at Baton Rouge to Esso Standard Oil Co., present operator, and the petroleum-butadiene plant at El Segundo, Calif., with a capacity of 50,000 tons per year, to Standard Oil Co. of California, also the present operator. The butyl plant had a book value at the end of 1953 of $9,378,000, and the butadiene plant was valued at $1,159,000, but additional equipment will be needed to enable it to produce butadiene of the proper specification.

The commission did not sell the alcohol-butadiene plant at Louisville, operated by Union Carbide & Carbon Corp., but is negotiating a lease of the 87,000-ton facility to interests other than the operator.

If these transactions and the sales consummated previously *(The Oil and Gas Journal, December 27, page 106)* are approved by Congress, a privately owned rubber industry will emerge with an annual capacity of 688,600 tons of

GR-S, 90,000 tons of butyl rubber, approximately 600,000 tons of petroleum butadiene, 215,000 tons of alcohol butadiene, and 62,500 tons of styrene. Closing the deals would end 12 years of government monopoly.

Terms not disclosed . . . Just how much will be secured from the sale of the rubber facilities probably will not be disclosed until the commission sends its report to Congress late this month. The original federal investment was approximately $700,000,000, and the book value of the plants on December 31, 1953, was $153,800,000.

The two plants left on the commission's hands were the 122,000-ton per year facility at Institute, W. Va., operated by B. F. Goodrich Co., and the 44,000-ton plant at Baytown, Tex., operated by General Tire & Rubber Co. The Institute plant has been in standby service for more than a year and, with the Baytown plant, will be mothballed under the terms of the Rubber Disposal Act.

Before the program goes to Congress for approval, the Attorney General will write an opinion on whether the sales will result in a competitive industry, meeting the requirements of the anti-trust laws. His opinion will be incorporated in the commission's report. The commission has been consulting with the Justice Department as individual sales were negotiated and is confident Atty. Gen. Herbert Brownell, Jr., will approve them.

It was announced recently that the Food Machinery & Chemical Corp., which signed up for the 90,000-ton petroleum-butadiene plant at Houston, will operate it jointly with the Tennessee Gas Transmission Co., which will acquire half interest in the facility.

Growth of industry . . . The synthetic-rubber industry got its start in 1942, when supplies of natural rubber from the Far East were cut off by Japanese conquest of the producing areas. The facilities were designed and constructed by the petroleum, rubber, and chemical companies which, for the most part, later operated them under the over-all supervision, planning, and control of the Government.

In all, 51 facilities were constructed for the production of GR-S, butyl and neoprene rubber, alcohol and petroleum butadiene, and styrene. After the war the one neoprene plant, four of the five styrene plants, and a number of other facilities were sold. When the Rubber Disposal Act was passed last year only 27 plants were still held by the Government.

Production of rubber began on a small scale early in 1943 and by mid-1945 reached an annual rate of nearly 1,000,000 tons.

WATCHING WASHINGTON

Bertram F. Linz

Ike Hints At Import Policy

What may be a preview of his stand on oil imports was given last week by President Eisenhower.

At Augusta, Ga., it was disclosed that the President will send a special message to Congress next Monday asking for a 3-year renewal of the Reciprocal Trade Act and authority to cut tariffs another 15 per cent during that period.

At the same time, Eisenhower rejected recommendations of three members of the Tariff Commission for a quota on imports of wood screws.

Like domestic oil producers, wood-screw manufacturers have made several attempts to secure relief from imports through escape clauses of reciprocal-trade agreements. They were turned down twice by the commission, which now is split evenly on the issue. The President sided with the three who held the industry has not been seriously injured.

There was a significant statement in the President's rejection of the quota system. The commission's reports showed that some manufacturers have experienced a decline in business, but four others show better returns. So, said the President, "such difficulties as have been encountered by some firms cannot clearly be attributed to imports since other domestic producers are operating successfully."

Boiled down, this could mean that if a mere handful of domestic-oil producers can operate successfully despite imports the President will reject the recommendation for a quota.

Democratic leaders in Congress have made it known they will support continuation of the reciprocal-trade program. Ranking Republicans on the House ways and means committee are expected to oppose it.

Offshore Jackpot Expected

Interior Secretary Douglas McKay expects the Government eventually to receive $6,000,000,000 from development of the outer Continental Shelf.

Pointing out that $144,000,000 has already been secured for drilling rights off Louisiana and Texas, McKay said the areas disposed of comprise only 3 per cent of the acreage mapped as potentially oil bearing.

McKay anticipates that the leasing of the federally owned submerged area will bring $1,000,000,000 in bonuses. At least $5,000,000,000 more is expected in royalties from the 11,500,000,000 bbl. of oil which the Geological Survey estimates to be awaiting development.

Opponents of Republican policies for development of natural resources charged a "give-away" when the tidelands were returned to the states in 1953, McKay said. Big returns from the first lease sales quieted that outcry for the time being, but McKay expects opposition to arise again.

"Oil" Stock to Be Probed

There are more barrels of oil stock than oil coming out of Canada, and the Securities and Exchange Commission wants to do something about it.

The commission believes that when stock in an oil venture is sold to the public there should be, at least, the smell of petroleum behind it. That is not always the case with Canadian securities sold in the U. S.

For years American investors were avid buyers of "blue sky" stocks in Canadian mining ventures which often didn't even have a mine to venture in. More recently, there has been a switch to oil ventures which too often were never drilled, and now uranium is becoming fashionable.

"Boiler room" operations involving a battery of telephones and a group of fast-talking salesmen make things tough for legitimate oil outfits and tougher for American investors. The Canadian Government is eager to wipe out the racket, but these operators are slippery. The SEC can't go after them because they are in a foreign country.

Now, the SEC proposes to investigate sales here of unregistered Canadian securities and turn the information over to the Canadians for possible prosecution. It will also suggest tightening of Canadian regulations for broker-dealer registrations.

The commission intends to confer with industry representatives, both here and in Canada, to see how far self-regulation can be carried.

Tanker Progress

Maritime chief says plans for building help picture

WASHINGTON. — Substantial progress has been made in upgrading American tanker tonnage, Chairman Louis S. Rothschild said last week in a year-end review of the operations of the Maritime Administration.

So far, Rothschild said, commitments have been made for the building of five new supertankers under the trade-in-and-build program, and contracts have been awarded for the construction of four vessels under the Navy tanker program.

Under the trade-in legislation passed by Congress last year the Government may acquire tankers 10 years old and older for the reserve fleet, in exchange for an allowance of credit on the purchase of new tankers.

The Navy program contemplated that the Government would build five supertankers and make long-term charters of 15 others to be built with private capital. The amount appropriated for government construction, however, has been enough only for four vessels.

School Bloc Seeks Oil Funds

WASHINGTON. — Indications that the federal Government will derive large revenues from oil and gas development on the outer Continental Shelf will fan a renewed fight in Congress to have the money earmarked for education.

The move has been headed by Sen. Lister Hill of Alabama and has been supported by other senators from states where funds for schools have been inadequate to meet growing needs.

Chances for enactment of the proposal, however, are dim in view of the fact the Government will continue to be in the red for at least the next 2 years and probably longer.

New Bid Forms Prepared

WASHINGTON.—New bidding forms for oil and gas leases on public lands have been prepared by the Interior Department, and amended regulations have been issued to comply with changes in the Mineral Leasing Act made by Congress last year.

The revised forms and regulations provide for increases in allowable acreage from 15,360 to 46,080 acres in a state and 100,000 acres in Alaska. They also provide for automatic termination of noncompetitive leases upon failure to pay rental when due.

SOUTHWEST

Flood Permits Asked

Backers say projects will gain 1,000,000 bbl. each

AUSTIN.—Two more Texas water floods expected to result in recovery of upwards of a million barrels of oil each have been submitted for approval of the Texas Railroad Commission.

The two floods, in opposite ends of the state, are proposed by Shell Oil Co. for Loma Novia field in South Texas and by a group of operators for Young County Regular field in North Texas.

Shell flood . . . The Shell flood is planned for the 2,700-ft. Loma Novia sand underlying its M. C. Hubbard and V. Mendoza leases, Duval County. Gas injection has been carried on in the area since 1940, but Shell said without water injection probably not more than 30 per cent of the oil in place would be produced.

J. H. Goatley, Shell spokesman, said the Loma Novia reservoir is considered an excellent prospect for water flowing due to its depletion characteristics, shallow depth, and uniform rock properties. He estimated the proposed 510-acre flood would recover 1,700,000 bbl. of additional oil.

There are 28 producing wells, now making a total of about 174 bbl. of oil daily, and six gas-injection wells on the two leases. Cumulative production is almost 3½ million barrels. The Loma Novia reservoir, which has a gas cap but produces under solution-gas drive, is in the final stage of depletion.

Shell plans to convert 16 present producers and the 6 gas-injection wells to water-injection service and inject about 300 bbl. of water daily per well through a closed system on a 10-acre, five-spot pattern. Replacement producers would be drilled for five of the wells earmarked for input service.

Water for the project would be obtained from the Cole sand at 1,900 ft. and injected at about 250 psi.

Young County project . . . The flood in Young County Regular—actually an extension of a pilot flood begun in 1946—is planned by Kleiner Estate, Turner, Fiske & West for a 550-ft. Gunsite sand underlying 350 acres of leases.

There are 77 producing wells on the acreage making an average of about 1 bbl. daily apiece. Gas repressuring has been carried on since 1930 and the reservoir discovered in 1928, is considered about 55 per cent depleted. The leases so far have produced about 3,000,000 bbl. of oil and are expected to produce another 1,000,000 bbl. due to the expanded flood.

Operators plan to conduct the project on an approximate 8-acre, five-spot injection pattern.

Imbibition Test Extended

AUSTIN.—The Texas Railroad Commission last week granted Atlantic Refining Co. permission to continue for another year its experimental water-imbibition project in Spraberry Trend Area field.

The extension was approved on the basis of testimony by Atlantic engineers early in December *(The Oil and Gas Journal, December 20, page 68)* that more time was needed to evaluate the feasibility of expanding the project.

Testimony showed that imbibition has been satisfactory in that 17 of 26 test wells have shown large increases in oil production since water injection began November 19, 1952.

By November of this year Atlantic had injected more than 1,100,000 bbl. of water into the Spraberry and was maintaining a daily injection rate of about 67,000 bbl.

San Juan Proration Due

SANTA FE, N. M. — Natural-gas production from wells in the San Juan basin of northwestern New Mexico will be prorated beginning March 1, the New Mexico Oil Conservation Commission announced last week.

The proration formula for San Juan pools will be similar to that already regulating production from Permian basin gas fields across the state in the Lea County area.

It is based 75 per cent on acreage multiplied by deliverability and 25 per cent on acreage alone. Standard proration unit was set by commission engineers at 320 acres, variable only on approval of the commission.

Gasoline Plant Planned

MIDLAND, Tex.—Cities Service Oil Co. and Forest Oil Corp. will start construction in March of a large natural-gasoline plant on recently developed acreage in Western Midland County.

The plant will be capable of processing 50,000,000 cu. ft. of gas daily from wells in the Dora Roberts Ranch and other producing areas in Western Midland and Eastern Ector counties. The installation will cost almost $7,000,000.

Production Allowables Up

Oklahoma and Kansas fall in line to boost crude output in January; pipeline proration or price cuts are hinted

OKLAHOMA CITY. — Oklahoma's allowable production of crude oil during January is 550,000 bbl. per day, an increase of 55,000 bbl. per day, or more than 10 per cent, over the allowables of 495,000 bbl. which have prevailed for the past several months.

The increase was approved at a special meeting of the Oklahoma Corporation Commission. It was contrary to the recommendation of Conservation Director Massena Murray, who wanted production kept at the December level, and to pleas of purchasers who nominated only 435,000 bbl. per day.

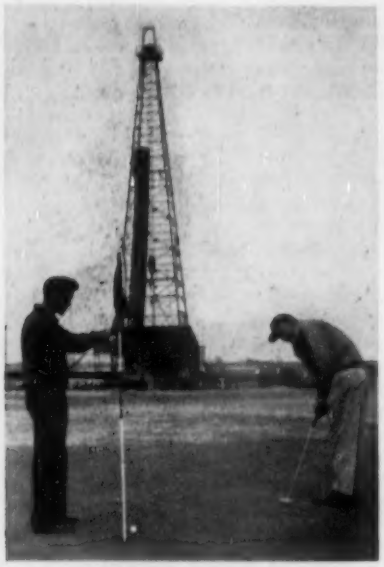
The special meeting was called by Governor-Elect Raymond Gary, who sat with the commission and declared that increased production is needed to boost state revenues. He was supported by a group of independent producers who pointed out that other states are increasing allowables and who insisted that refiners would use more Oklahoma crude if it is made available.

New curb hinted . . . Purchasers testified that they are already taking 60,000 bbl. per day of Oklahoma crude above their needs and that they will find it difficult if not impossible to find markets for the additional output in January. Hints were dropped that pipeline proration or price reductions might result from a glutted crude market in the Mid-Continent.

The Oklahoma order raises the per well minimum allowable from 15 bbl. to 20 bbl. per day, except for wells under special rules limiting gas-oil ratios. It permits an increase of 10 per cent in the output of all other wells.

Simultaneously the Kansas Corporation Commission increased that state's January allowable to 330,000 bbl. per day, 5,000 bbl. per day over the December allowable. The increase will be held to wells that have had underages the last of 1954. Purchasers had asked for an allowable of 287,020 bbl. daily.

Earlier Texas had raised its January allowable by about 278,000 bbl. per day over December, Louisiana by 43,000 bbl. per day, New Mexico by 8,000 bbl. per day, and North Dakota by 13,000 bbl. per day.



New Course Hazard

This rig drilling a 13,500-ft. Ellenburger test is the first to be drilled on the Odessa Country Club golf course. The course, which straddles the Ector-Midland county line, is surrounded by production and has Ellenburger wells to the north, south, and west. Bill Breeden, club member, is shown here putting while Charles Tims, assistant club professional, holds the pin. Gleeful members of the club conservatively estimate the eventual royalty income from the 200-acre course at $8,000 a month.

Climax Buys Leases

Metal firm gets Whitehill properties for $5,000,000

TULSA.—Climax Molybdenum Co., the world's largest producer of molybdenum, last week doubled its oil production holdings with the $5 million purchase of northeastern Oklahoma leases formerly held by Whitehill Oil Corp., Tulsa.

The leases, covering about 13,500 acres, have a daily production of approximately 1,500 bbl. Most of the acreage involved is in Nowata and Rogers counties, but the transaction also included producing properties in Tulsa, Creek, and Seminole counties, together with minor holdings in Texas and New Mexico.

Climax made the purchase from William J. Sherry, Tulsa oil operator, who had previously acquired the properties from the Whitehill corporation and members of the Whitehill family. The Whitehill Oil Corp. has been dissolved. It was founded in 1927 by the late Benjamin F. Whitehill who drilled his first Oklahoma producing well in 1905. The corporation has been headed by Howard J. Whitehill, son of the founder, since the elder Whitehill's death in 1930.

Last week's sale was the second multi-million dollar transaction for Sherry in 2 months. In November, Murphy Corp., El Dorado, Ark., paid Sherry $6 million for producing oil and gas leases Sherry received as his interest when Marine Oil Co. was partially liquidated *(The Oil and Gas Journal, November 15, 1954, page 161).*

Water flood to expand . . . The Nowata and Rogers county properties are producing from the Bartlesville sand and about 1,200 acres are now being water flooded. The new owners plan an intensive program of additional development of this project.

Climax will operate the properties as the Climax-Brundred Waterflood Division of its oil department, headed by Gay V. Land, New York, L. L. Brundred will be division manager in direct charge of the property. He will be located in the former Whitehill office in Tulsa.

Little Chief Has Big Well

TULSA.—Sunray Oil Corp. has completed one of the largest wells to date in the Little Chief area west of Pawhuska, Oklahoma, marking another success in an area which is the center of a drilling boom.

Sunray's 11 Osage was completed flowing at the rate of 2,345 bbl. per day through ¾-in. choke. The company has also completed 6 Osage, 7-25n-7e. This well was fractured at 2,908 ft. to produce at the rate of 432 bbl. per day.

New Oklahoma Map Ready

WASHINGTON.—A geological map of Oklahoma, the first published since 1926 and representing 7 years of work in cooperation with the Oklahoma Geological Survey, has been completed by the United States Geological Survey.

The map shows, by color patterns, the areal distribution and extent of more than 125 different rock units ranging from ancient granites of pre-Cambrian age to alluvial deposits of sand and gravel along streams.

First Shelf Unit . . .

. . . covers big offshore area held by CATC group

WASHINGTON.—The first unitization plan for development of oil and gas leases on the outer Continental Shelf has been approved by the Interior Department.

The contract, signed by Asst. Sec. Felix Wormser, covers a group of leases originally issued by Louisiana to Continental Oil Co., Atlantic Refining Co., Tide Water Associated Oil Co., and Cities Service Oil Co. before the Supreme Court held that the federal Government had "paramount rights" to all submerged resources beyond the low-water mark. The leases were validated as federal leases following enactment of the tidelands legislation in 1953.

The CATC leases total 51,580 acres 13 miles south of Grand Isle and comprise Blocks 38, 39, 40, 41, 46, 47, 48, 49, 51, and 52 and the west half of 53.

Most of the leases expire December 17, 1956 and several in March 1957 unless a discovery is made.

Reports to Washington indicate that Continental, which will act as unit operator, is about ready to start drilling operations from a deep-water platform now under construction.

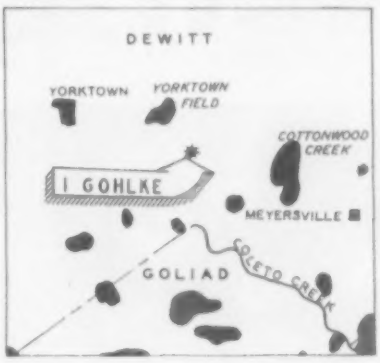
The CATC operations will be in the deepest water yet challenged in shelf operations—90 to 120 ft.—and it is estimated that the cost of the platform and equipment to drill the first well will be about $1,700,000.

Drilling schedule . . . Under terms of the unit agreement, the group will have to start drilling its first well within 6 months, and a minimum of five wells, including at least one on a separate structure, must be started within about 2½ years. At least one well is to go to 10,000 ft.

If the first well is successful, a second well must be started from the same platform within 90 days. If the first well is unsuccessful, the second may be drilled from either the same or a different location within 6 months.

Regardless of the second well's results a third well is to be started within 6 months of its completion. If any two of the first three wells are successful, a fourth well must be started within 6 months.

The initial term of the unit agreement is to expire December 31, 1959, or when it is determined no production is possible. The term will be continued indefinitely if a discovery is made.



Gas Field Tapped

South Texas discovery also yields distillate

YORKTOWN, Tex.—A new gas-distillate field is being uncovered 3 miles southeast of here, in South Texas' De Witt County.

The discovery well, 1 Gohlke, drilled by D. D. Feldman Oil & Gas Co., Dallas, is rated good for 15,000,000 cu. ft. of gas daily on open flow, with distillate recovery of 24.6 bbl. per 1,000,000 cu. ft. of gas. Gravity of the distillate is 70°.

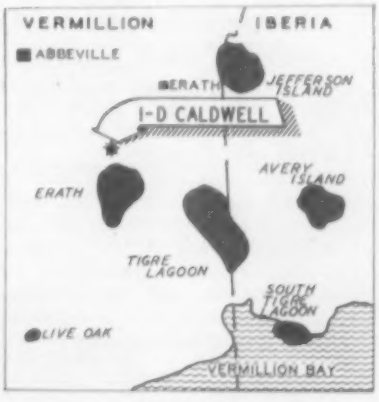
Flow through 14/64-in. choke was at the rate of 2,937,000 cu. ft. of gas daily, with pressure of 3,175 psi.

Production is from perforations at 7,324-25 ft. in the upper Wilcox sand. Hole was drilled to 7,707 ft.

Gas-Distillate Hit

Louisiana discovery may extend big Erath field

ABBEVILLE, La.—What appears to be a prolific gas-distillate reservoir is being opened by Phillips Petroleum Co. in a deep wildcat a mile north of the large, multiple-pay Erath field, 6 miles south of here, in eastern Vermilion Parish.



The discovery, which might indicate either a separate field or a major extension and deeper producing sand for Erath field, is in a 52-ft. Miocene sand. Production is from casing-perforated interval at 13,018-38 ft. The sand is below the deepest zone previously drilled in Erath field.

On pre-potential tests, the discovery well, 1-D Caldwell, flowed through various small chokes at the rate of 372 bbl. of 45°-gravity distillate and 6,300,000 cu. ft. of gas per day.

Three additional gas-bearing formations were logged between 6,140 ft. and 11,820 ft.

Phillips is drilling another deep wildcat, its 1 Champagne, about a mile to the west and approximately 2 miles north of production in Erath field.

Erath field, discovered in 1940, has proved one of South Louisiana's most important gas-distillate fields and has one of the Gulf Coast's largest gas-cycling and pressure-maintenance operations. Its multiple producing sands range in depth from 7,000 to 11,575 ft.

L.P.G. Cavern Approved

AUSTIN.—The Texas Co. has received approval from the Texas Railroad Commission to create a 200,000-bbl. cavity in the Sour Lake salt dome of Hardin County, Texas, for storage of L.P.G. products from its Port Arthur refinery.

Texaco expects to log the top of the salt at about 1,000 ft. There is about 200 ft. of anydrite cap rock overlying the salt, which will provide an impervious seal. Brine from the leaching will be disposed of by injecting it into a salt-water sand.

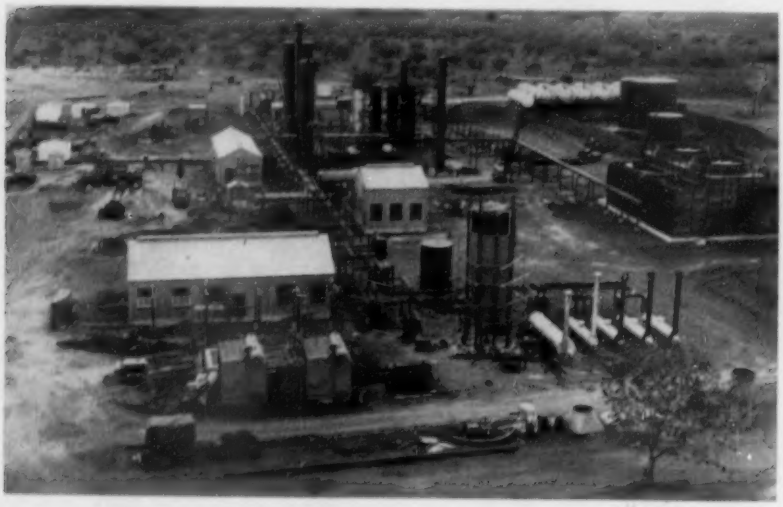
Company Pleads Innocent

HOUSTON.—A chemical firm, accused by civic groups as an air-pollution offender, struck back at its critics last week with studies to prove it contributes "little, if at all" to the Ship Channel's air pollution problem.

E. S. Rothrock, executive vice president of Consolidated Chemical Industries, Inc., says a trace of sulfure dioxide from the company's smokestacks accounts for only about 2 per cent of that type of gas entering the atmosphere of the Ship Channel area. Rothrock said 98 per cent of the sulfur dioxide, dust, fumes, smoke, and odors which mix with automobile exhausts to

produce "smog" come from other sources.

Consolidated Chemical retained Stanford Research Institute to make studies of its operation and advise it what steps it should take to help eliminate pollution. Rothrock said his company recently spent $1,000,000 to reduce its exhaust of sulfur dioxide by two-thirds. The company also has increased the height of its stacks to obtain more effective dispersion of gases.



United adds another . . .

. . . Natural-Gasoline Plant

RUNGE, Tex.—United Gas Pipe Line Co.'s big Cabeza Creek natural-gasoline plant 8 miles southeast of here in Karnes County, South Texas, is due to go into operation this month.

The new plant will be the second largest of the company's seven natural-gasoline installations, ranking in size next to the huge Carthage field plant in East Texas. It will process 100,000,000 cu. ft. of gas daily at capacity and recover about 45,000 gal. of L.P.G. and about 25,000 gal. of debutanized gasoline a day.

Wet-gas feed will come from 26 fields in the Cabeza Creek and Hordes Creek areas, which cover most of Goliad County and portions of Karnes and De Witt counties. The fields are Slick-Wilcox, Albrecht, Boyce, Brandt, Breeden, Cabeza Creek, East Melrose, Gottschalt, Melrose, Poehler, South Cabeza Creek, South Weesatche, Weesatche, West Weesatche, Marshall, West Boyce, Heinzeville, North Charco, Hordes Creek, Gladys Powell, River, Emma Haynes, South Porter, Pargman, Weser, and East Slick-Wilcox.

Contractor on the job is Fish Engineering Corp., Houston. Dehydration facilities, including two 55,000-M.c.f., three-bed packaged dehydration units, have been in operation since November. They are an adsorption type, using a solid desiccant to remove water vapor.

Dry gas will enter United Gas Pipe Line's 16-in. line extending 6 miles west of the plant to a tie-in with the firm's 16-in. Pettus-to-Converse, Tex., carrier. The 16-in. line from the plant also will connect with the company's 20-in. Burnell-to-Converse line about 2½ miles west of the Pettus-Converse junction.

Rocky Mountain

New Unit Testing

Conoco natural-gasoline plant goes on stream soon

DENVER.—A new $2,000,000 natural-gasoline plant and gas-gathering system 20 miles south of Brush, Colo., is being broken in and the unit will go on stream in mid-January.

The new plant, 75 miles east of here, will process gas from Little Beaver, Badger Creek, and Bobcat oil fields of Washington and Adams counties. Continental Oil Co., operator of the plant, says capacity will be 10,000,000 cu. ft. of gas daily, producing about 70,000 gallons of liquid products.

Lance Creek plant . . . Effective Feb. 15, the propane will replace marketed supplies formerly obtained from Continental's Lance Creek gasoline plant at Lusk, Wyo., where operations are being curtailed after 17 years of repressuring the Sundance sand. A new program there, aimed at increasing production in the Lance Creek oil area, calls for abandonment of repressuring and involves large-scale water flooding of the basal Sundance.

The flooding will result in a sharp reduction in Sundance gas production. J. L. Johnston, regional manager of Continental's production department, says that original production of 25,000,000 cu. ft. of gas daily has dwindled to between 10,000,000 and 12,000,000 cu. ft.

Johnston added that although 14 Lance Creek plant employes, nearly half the working force, are being transferred to the Brush plant, there are no immediate plans for shutting down the operation, as reported in the December 20 issue of the Journal.

Pilot Flood Planned

CASPER, Wyo.—Trigood Oil Co. plans a pilot water flood project for the Newcastle sand of Fiddler Creek in Weston County, Wyoming.

A 26,800-acre block in the field, where there has been no economic production for more than a year, is in the process of unitization.

The initial flood will include 160 acres and will be extended across the unit if results warrant, Trigood General Manager H. G. Gernert says.

Beginning in March, the pilot flood will inject 2,000 to 3,000 bbl. of water daily in the Newcastle sand, between 4,500 and 5,600 ft. There is about a 10-foot sand section in the field, discovered in 1949.

Gernert estimates it will be 6 to 9 months before an increase in production can be expected.

Proration to Be Discussed

DENVER.—The Rocky Mountain Oil and Gas Association will hold a special meeting here January 5 to discuss proration legislation proposed in Wyoming, Colorado, and Nebraska.

The meeting, called by W. W. Flenniken, association president, is expected to answer questions posed by a recently-organized committee of independent producers, landowners, and royalty owners opposing such legislation. This group is headed by R. S. Shannon, Jr., Shannon Oil Co., Denver.

The R.M.O.G.A. executive committee endorsed market-demand proration for the three states at a mid-1954 meeting in Billings, Mont.

BROWN

SOS Detachable

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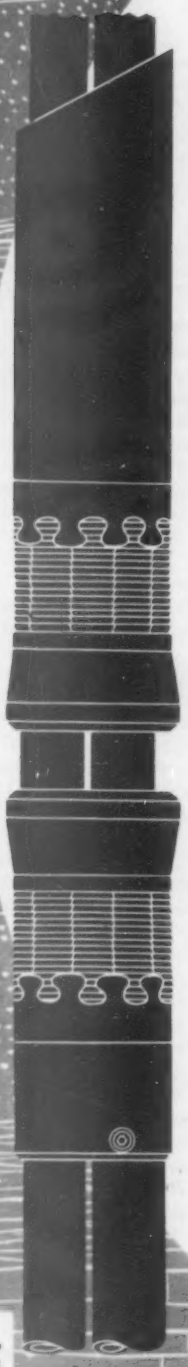

(Picture shows two 2" tubing strings in 7" pipe.)

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Advantages of Dual String Installations

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Foreign Production Hits New High

Free-world output outside U. S. soars to 6,141,600 bbl. daily with Kuwait, Iraq, and Venezuela leading the field

Dahl M. Duff

CRUDE-OIL production outside the United States hit an all-time high during October.

Foreign output, exclusive of Russia and other Communist countries, averaged 6,141,600 bbl. daily, 4.5 per cent over the previous month. It was the first time foreign production has exceeded 6,000,000 bbl. daily. The October output was 242,400 bbl. daily above the previous foreign production record in July 1954.

This record-high foreign production, coupled with a small loss in the United States, carried total free-world production to 12,270,000 bbl. daily, 2.0 per cent above the previous month.

By contrast, United States production again showed only a minor decrease of about 15,100 bbl. daily over September. United States production in October averaged 6,135,400 bbl., which was 126,100 bbl. daily below October 1953.

The leaders . . . The substantial increase in non-Communist foreign production was due largely to higher output in Kuwait, Iraq, and Venezuela. Kuwait's output topped a million barrels for the third time in the shaikhdom's history and established a new record for this territory. As a result of seasonal increase in fuel-oil demand, Venezuelan production was at its highest level since last December. Crude output in Iraq established a new record.

Figures for average production during the first 10 months of 1954 show the extent of the continued greater increase in foreign production over that in the United States. Total free-world production during the first 10 months gained 3 per cent over the same period of 1953. Non-Communist foreign output during the same period gained 9.7 per cent. That most of this increase was in the Middle East is shown in the 11.1 per cent gain chalked up in this region during the first 10 months.

Middle East production in October averaged 2,898,600 bbl. daily, 7.2 per cent over September to a new record. The previous high was last March when output hit 2,767,600 bbl. daily.

Kuwait's record 1,071,600 bbl. daily in October was 140,600 bbl. daily over September. The previous high for the shaikhdom was the 1,012,200 bbl. daily average last March.

Iraq's 668,300 bbl. daily in October was 23,800 bbl. daily over the previous month. Of the individual fields in Iraq, Kirkuk yielded a record 516,700 bbl. daily and Zubair 114,100 bbl. daily, also a new high.

Iraq Petroleum Co., Ltd.'s output in the Persian Gulf shaikhdom of Qatar also hit a new record 4,800 bbl. daily above the previous high for this territory last July.

For the first 10 months of the year, production of the major Middle East producers averaged as follows: Kuwait, 938,600 bbl. daily; Saudi Arabia, 956,700 bbl. daily; and Iraq, 626,600 bbl. daily. Saudi Arabian production in October showed only a relatively small gain of about 20,000 bbl. daily over the previous month.

Small countries gain . . . A noticeable feature of the production reports for the latter part of 1954 has been the sharp upward trend in a number of smaller countries where output hitherto has been relatively stationary. These coun-

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total non-Communist foreign
1953—			
November	2,651.9	2,341.7	5,461.6
December	2,711.9	2,540.2	5,714.1
1954—			
January	2,682.8	2,491.2	5,636.4
February	2,703.7	2,550.6	5,695.3
March	2,642.9	2,767.6	5,872.7
April	2,565.1	2,642.0	5,653.1
May	2,639.3	2,766.0	5,863.8
June	2,648.5	2,685.0	5,805.5
July	2,667.0	2,758.7	5,890.9
August	2,663.7	2,749.5	5,891.9
September	2,704.5	2,702.2	5,879.2
October	2,750.0	2,898.6	6,141.6

CRUDE-OIL PRODUCTION
(Daily average in thousands of barrels)

Country—	Oct. 1954	Sept. 1954	Oct. 1953
W. Hemisphere:			
Argentina	80.0	80.6	76.1
Bolivia	5.6	5.0	1.8
Brazil	3.2	3.0	2.2
Canada	279.0	295.5	233.4
Chile	5.0	5.0	4.5
Colombia	107.8	106.2	109.0
Cuba	0.4	0.4	0.1
Ecuador	8.7	8.5	8.5
Mexico	237.0	237.0	192.8
Peru	46.0	46.2	45.7
Trinidad	65.3	64.3	62.4
Venezuela	1,910.0	1,852.8	1,785.8
Total	2,750.0	2,704.5	2,522.3
W. Europe & Africa:			
Algeria	1.4	1.3	1.5
France	15.3	11.7	7.3
Fr. Morocco	2.5	2.4	2.2
W. Germany	56.5	54.2	45.4
Italy	1.4	1.4	1.7
Netherlands	18.3	18.7	17.4
Egypt	38.0	37.3	44.8
United Kingdom	1.2	1.2	1.1
Total	134.6	128.2	121.4
Middle East:			
Bahrain	30.1	30.1	30.0
Iran	30.0	32.0	29.0
Iraq	668.3	644.5	582.4
Kuwait	1,071.6	931.0	956.3
Neutral Zone	29.0	24.0	
Qatar	106.3	97.3	84.2
Saudi Arabia	961.5	941.9	851.7
Turkey	1.8	1.4	0.5
Total	2,898.6	2,702.2	2,528.1

Country—	Oct. 1954	Sept. 1954	Oct. 1953
Other Asia:			
British Borneo	100.0	99.0	103.5
Burma	3.7	3.7	3.4
India	7.0	7.0	6.6
Indonesia	223.0	210.0	221.2
Japan	5.7	5.6	6.0
New Guinea	13.5	13.5	4.7
Pakistan	5.5	5.5	4.1
Total	358.4	344.3	349.5
Total non-Communist foreign	6,141.6	5,879.2	5,521.3
United States	6,135.4	6,150.5	6,261.5
Total	12,277.0	12,029.7	11,782.8
Communist-controlled countries:			
Russian zone of Austria	60.0	60.0	62.0
Romania	120.0	120.0	110.0
Russia	1,185.0	1,185.0	1,060.0
Others	36.8	36.8	34.7
Total	1,401.8	1,401.8	1,166.7
World total	13,678.8	13,431.5	12,949.5

Figures are from reliable reports in the industry or official government sources. Data from Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where completely current reports are lacking. Other Communist includes China and Yugoslavia as well as the Soviet satellite countries in Europe.

tries include Bolivia, France, Brazil, and Trinidad.

Crude production of metropolitan France has more than doubled due to the Esso discovery in the southwestern part of the country. Of the October total output of about 15,300 bbl. daily, the Jersey Standard affiliate contributed some 8,300 bbl. daily.

Bolivian production has more than trebled during the last year with the discovery of a new horizon in Camiri field. Trinidad's increased production, now higher than the previous wartime peak, reflects continued success in new pools and field extensions.

Firms Organized . . .

. . To build and finance Colombian products line

TWO new companies have been organized in Colombia to build and finance the projected 65-mile products pipeline from the Pacific Coast port of Buenaventura to Cali.

One is Oleoducto del Pacifico, S. A., which will obtain the concession from the Colombian Government for the line, and the other is Promotora de Inversiones, S. A., which has been given an option to buy up to 60 per cent of the stock of Oleoducto del Pacifico.

The remaining 40 per cent of the stock of Oleoducto del Pacifico will be taken by International Petroleum Co., Ltd., the dominant marketer in the country. Promotora de Inversiones is to offer 10 per cent of the Oleoducto stock to oil companies operating in Colombia, and the remaining 50 per cent to the Colombian public, according to reports from Bogota.

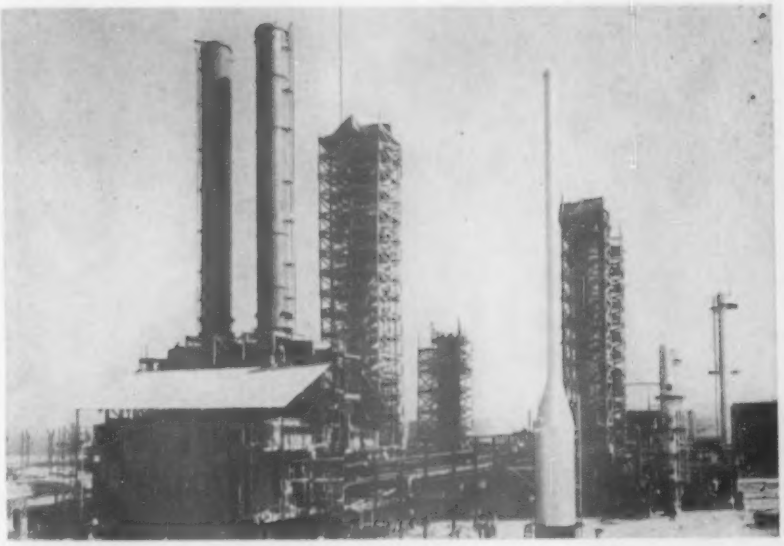
About 40 miles of the line will consist of 8-in., and the remainder of 6-in. Engineers of Pipeline Engineering Co., Dallas, are making surveys of the route. The line will move L.P.G. as well as white products and diesel oil into the Cali area where current consumption is around 5,000 bbl. daily.

Pemex Finishing Gas System

Petroleos Mexicanos is planning to complete its Monterrey-Saltillo-Torreon-Monclova natural-gas pipeline system in 1955.

The Monterrey-Torreon line, already under construction from both ends, will consist of 211.2 miles of 12 and 16-in. pipe designed to move up to 100,000,000 cu. ft. of gas per day. A branch extends off this trunk to Saltillo, while another line is planned from Monterrey to Monclova to the northwest.

Pemex's eventual plans call for extending the Torreon line northwest to Chihuahua.



Refinery in Brazil On Stream

SOUTH AMERICA'S newest thermal refinery, a 10,000-bbl. plant built at Rio de Janeiro for Refinaria de Manguinhos, S. A., has started commercial production.

The new plant was dedicated in mid-December to climax a 9-month construction program conducted by M. W. Kellogg Co. Construction of the plant was directed by the Kellogg Pan American Corp.

All major processing operations are coordinated into one combination refining battery with certain process steps sharing common pieces of equipment. The processes incorporated in the combination unit are crude topping, light gas-oil cracking, reduced-crude visbreaking, and light-ends recovery.

The plant is designed to operate on East Venezuelan (Oficina) crude, but is designed for the addition of naphtha reforming to handle any Arabian crude that might be used.

In the integrated operation, oil streams flow hot from one stage to the next without passing through coolers or intermediate storage. At several points, there is heat exchange between streams in different process stages.

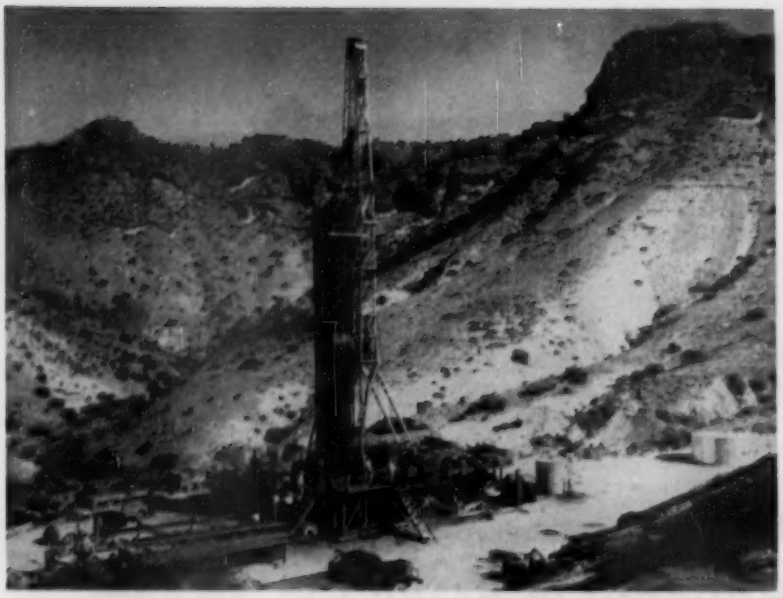
Refinaria de Manguinhos is a newly organized company, and the Rio de Janeiro refinery is its first refining venture.

International Briefs

Shares of International Egyptian Oil Co. which have been acquired by Petrofina (Cie. Financiere Belge des Petroles) amounted to half the 51 per cent held by Swiss interests. The other half of the 51 per cent has been blocked with the Petrofina shares by the Swiss group. This clarifies earlier reports on the transaction *(The Oil and Gas Journal, November 22, page 74)*.

Cia. Helios, S. A. will erect facilities to produce ammonia fertilizer with a 20½ per cent nitrogen content in connection with the small refinery it plans to build at Pisco, about 150 miles south of Lima in Peru. The fertilizer plant will use refinery gases. Helios, headed by Alejandro Malone, has a concession from the Peruvian Government authorizing the refinery project. The Helios refinery will have a capacity of about 2,000 bbl. daily and will produce largely lubricants and paraffin.

The Colombian Government has contracted to sell Barco royalty crude oil to Uruguay where the government-owned ANCAP operates a large refinery. The Barco concession of Colombian Petroleum Co. produces about 27,500 bbl. daily, and the Colombian Government receives 10 per cent royalty. Uruguay is reported to be interested only in the higher gravity (48.6°) crude which comprises less than 10,000 bbl. daily of the Barco output. ANCAP formerly bought part of its crude requirement from the Chilean Government's ENAP, but this production is now going to the new ENAP refinery near Valparaiso.



PORTABLE RIGS are being used extensively in Australian wildcatting because of the tremendous distances covered by active exploration. This mobile unit is drilling in the Cape Range near Exmouth Gulf.

Last year only one area was active. Now . . .

Australia Shifts Gears

IN just over a year, oil exploration in Australia has grown from almost total inactivity to become one of the nation's biggest avenues of new investment.

Where last year there was only one minor point of interest at Roma, Queensland, today about half the continent's 3,000,000 sq. miles is being actively prospected by 41 companies.

In a year, the equivalent of about $50,000,000 has been either raised on the market or committed privately to the search—equal to nearly 6 dollars per head of population.

Six areas are being drilled and plans to test six more await only the arrival of rigs from the United States early this year.

In all states except the island of Tasmania, geological and geophysical investigations, airborne and on the ground, government and private, are being extensively employed.

LEADERS of the oil search in Western Australia are (left to right): George M. Cunningham, president of American Overseas Petroleum; Al Dysart, drilling superintendent, Brown Drilling Co. of California; Charles Knife, a director of Ampol Exploration, Ltd.; Jack Stewart, district superintendent for WAPET; William Walkley, chairman of Ampol; and Frank Morgan, Ampol's chief geologist.

The search in Papua, hampered for the better part of a year by mechanical holdups and having already cost $30,000,000 since just before World War II, is reaching the stage where important conclusions should soon emerge.

Oil Discovery at Rough Range

On the mainland, highlight of the year's interest and the spur that touched off the current exploration boom, was the strike by West Australian Petroleum Pty., Ltd., in its first wildcat at Rough Range, Exmouth Gulf, on Australia's most western tip.

Owned 80 per cent by Caltex and 20 per cent by the local Ampol Exploration Ltd., WAPET encountered a flow of 20 bbl. an hour through a ¼-in. bottom-hole choke at 3,605-20 ft. in the Cretaceous in December 1953.

For stratigraphical information, 1 Rough Range has been carried on to 12,500 ft. and is drilling ahead having met only slight traces of oil and gas below the producing sand.

Meanwhile, WAPET has been using mobile National T32 rigs to further test the extent of Rough Range pool but has gained only information on the rather confused picture of subsurface conditions. No. 2, drilled 6,200 ft. southwest of the discovery well, encountered the sand structurally lower at 3,771 ft. but an open-hole formation test recovered only salt water and the hole was abandoned at 4,040 ft.

No. 3 was drilled 3,000 ft. northeast of No. 1 but with the same result and No. 4, sited 1,732 ft. due south, failed similarly. The company spudded in No. 5 during November, 2,034 ft. west of No. 1.

Up to now, information from surface geology, drilling, and seismic findings have pointed to two differing but equally plausible interpretations of subsurface structural conditions. As drilling has ruled out one of the possibilities visualized, planning of future operations will be considerably aided by the guideposts already established.

The company's view . . . Prospects at Rough Range were succinctly put recently to a group of visitors to the field by George M. Cunningham, president of American Overseas Petroleum Ltd., the Caltex exploration affiliate, when he said "Our geologists are not so good that in picking the site for the first hole they found the only oil pool in Australia."

This view epitomizes WAPET's approach to its task. Simultaneously with its drilling of the Rough Range structure, it is also testing the considerably larger Cape Range structure 30 miles away where a rig at Shothole Canyon now approaching 6,000 ft. has consistently met gas showings and oil traces.

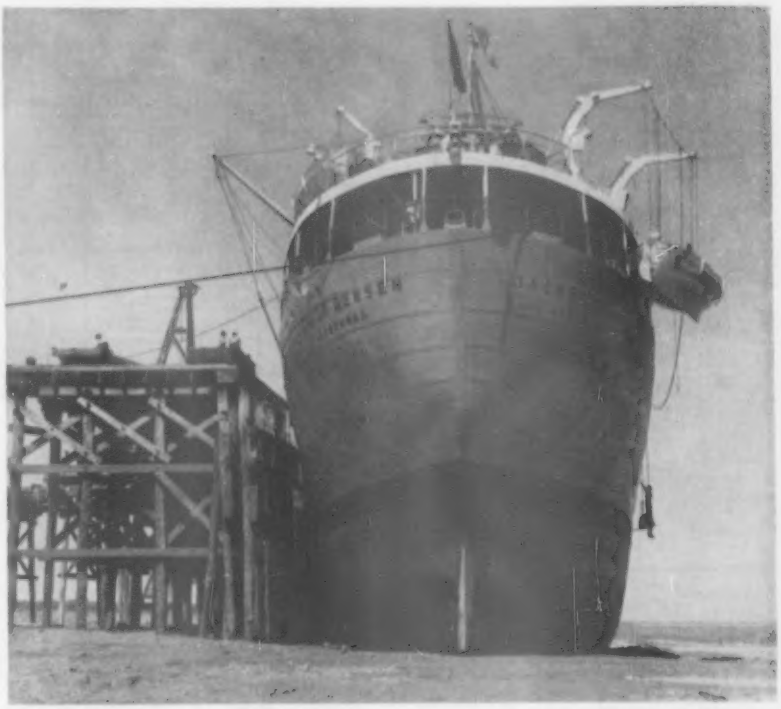
Farther north in the Fitzroy basin 1,500 miles up the western coast from Perth, the company spudded in a National 100 in its first wildcat on the Grant Range structure early in November.

WAPET's spread . . . The company's operations are rendered all the more difficult by the enormity of its 325,000-sq. mile permit area held in six blocks, each of which must be actively prospected if it is to hold them.

The whole region is largely uninhabited, settlements are hundreds of miles apart and connected by only the roughest of tracks, water is scarce, and food has to be flown in daily.

To keep four rigs operating when the nearest of them is 700 miles and the farthest is 1,500 miles from company operational headquarters at Perth has involved large expenditures.

Up to the first of 1954, the company had spent $3,000,000. This year it will spend $6,000,000 and, on the assumption that commercial oil fields will be established at Rough Range and Cape Range, the company has announced plans to spend $16,000,000 in 1955 and $14,000,000 in 1956.



LOW TIDE at Derby, Australia, brings a water level drop of 32 ft.—and creates such scenes as this ship sitting high and dry at low tide next to the Derby jetty.

Eastern Australia Areas

In Queensland, 3,000 miles east of the WAPET areas, three prospects are being drilled. Associated Australian Oilfields in sinking its fifth hole at Roma where strong flows of petroliferous gas have been encountered. At Reid's Dome, near Springsure, where Santa Fe Drilling Co., of California, is drilling for Australian Oil Exploration Ltd., petroliferous gas at a flow of 20,000 cu. ft. a day and traces of oil were encountered at 4,500 ft. during November.

Also drilling in Queensland is Lucky Strike Co., of Tulsa, which has just begun a deep test of its area near the coast at Maryborough.

One of the biggest association of interests is that of Anglo-Iranian and Standard Vacuum which, through subsidiaries, have joined with the powerful Australian mining company, Consolidated Zinc Pty., Ltd., and several local oil syndicates to form Frome-Broken Hill Pty., Ltd., and Frome Lakes, Pty., Ltd.

This group holds large permit areas in West Australia, South Australia, Victoria, and Queensland and is carrying out intensive geological and geophysical investigations. Its first drilling will probably be in the Gippsland basin of Victoria where the presence of oil and gas has been known for many years.

Latest of the major overseas oil companies to join the Australian search is Shell which holds a 75 per cent interest in a group it has formed with three wealthy mining companies to prospect in West Australia if suitable areas can be obtained in the next allocation of permit areas due to be made shortly.

Of the purely local companies which have not yet begun drilling, two are assembling plant for spudding in early in the new year. Associated Freney Oilfields, Ltd., is erecting a National 55 on the Nerrima Dome in the Fitzroy basin about 40 miles from WAPET's Grant Range site. Australian Oil & Gas Corp. is planning to test the Sydney basin.

Taken together, the combined efforts of the 41 companies now engaged in oil exploration in Australia have assembled in the past 12 months or so more knowledge of the continent's oil-bearing possibilities than has been gained over nearly 50 years of previous sporadic activity.

Papua . . . But though there are many signs of encouragement on the mainland, it is in Australia's territory of Papua that the most detailed and systematic work has been done. Here, two companies, Island Exploration Co. Pty., Ltd., and Australian Petroleum Co. Pty., Ltd., have been operating since 1938. Both are owned by Anglo-Iranian Oil Co., Ltd., and Standard Vacuum of New York although the Australian firm of Oil Search, Ltd., owns a 10 per cent interest.

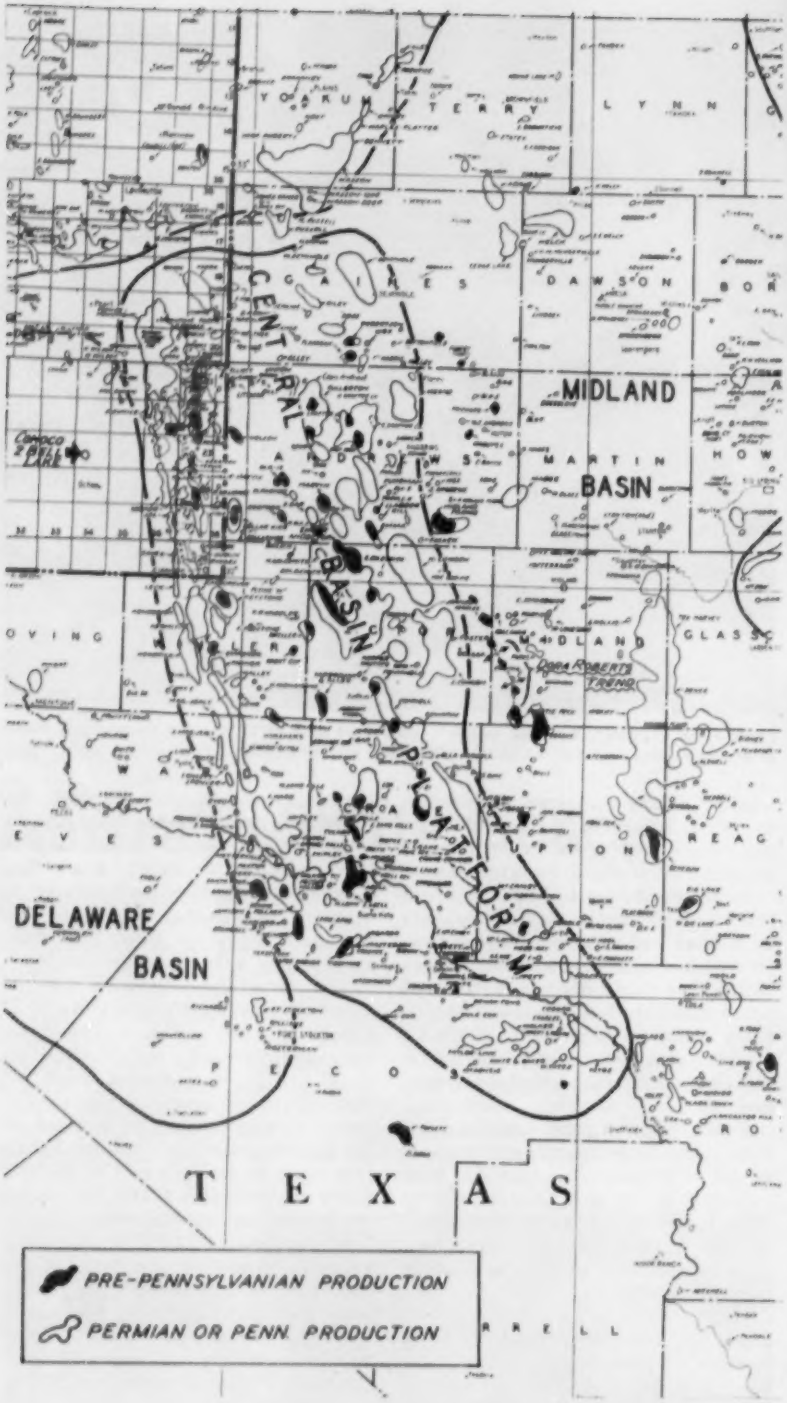
They have reached the stage where 20,000 sq. miles of western Papua have been aerially photographed. Geological investigations have also covered 20,000 sq. miles and 20 structures have been examined in detail. More than 22,000 sq. miles have been covered by magnetic, gravimetric, and seismic surveys and 35,000 sq. miles have been traversed by airborne magnetometer.

The accumulated evidence has focused major attention upon two tests at Omati. In June 1953, 1 Omati encountered extremely high-pressure gas at 13,743 ft.—the greatest depth yet reached in the Southern Hemisphere. Before evidence could be obtained on the significance of the show, the formation caved in the open part of the hole below the casing at 12,041 ft. causing the bit and drill pipe to stick.

Sidetracking at 11,666 ft. was commenced and drilling went on to within 815 ft. of the high-pressure gas horizon when a further long delay was caused by leaks in the 6⅝-in. casing. In mid-September drilling was resumed and on the latest November report was 321 ft. above the gas zone.

However, while this hole is expected soon to show whether oil will be found below 13,743 ft., seismic investigations indicate even more favorable prospects for 2 Omati sited 2 miles westward.

Commenced in April this year, 2 Omati has been jammed since August at 7,500 ft. Rerunning of 13⅜-in. casing is proceeding and a National 130 has been installed to handle the heavier load when drilling resumes.



1. Close relationship between . . .

Exploration efforts in West Texas are geared to locating new Ellenburger reserves at drilling depths of 12,000-14,000 ft. Ellenburger wells are prolific with many of them falling in the million-barrel class. Subsurface geology and seismic work are proving to be the best methods for finding these rich producing areas.

2. Ellenburger production . . .

Ellenburger... Word in

by Norman S. Morrisey
Drilling and Development Editor

UNTAPPED pre-Permian structures with vast oil reserves underlie many of the known Permian producing areas in West Texas. Production from these future oil fields may even exceed that from the present pre-Permian pools.

Ellenburger has become a magic word in West Texas oil circles during the past few years. Recent developments indicate that several of these Ellenburger fields will reach major field status with ultimate recoveries of over 100 million barrels of oil each. Big Lake has passed this goal; TXL, discovered in 1945, has already produced 73 million barrels from the Ellenburger.

New concepts . . . Oil companies realize that the West Texas pre-Permian exploration campaign has not reached maturity. The campaign started in 1928 with the discovery of Big Lake and has been steadily gaining momentum.

Geologists are emphasizing folding and faulting, rather than facies changes, reefing, porosity pinchouts, and wedge edges. The Permian basin is not a simple geological province in West Texas thinking. The pre-Permian area

3. and shallow production . . .

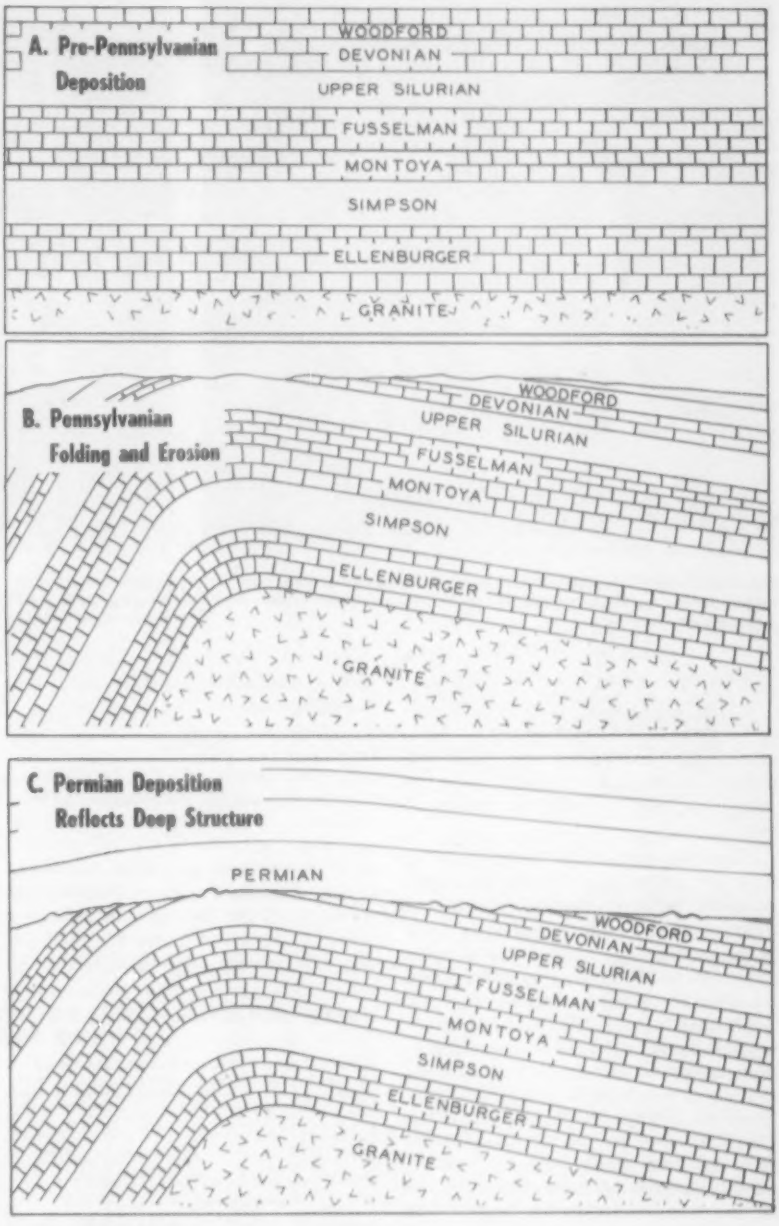
It's a Magic West Texas

is a structural domain with regional uplifts and basins rather than a broad, flat, depositional basin where stratigraphy is all important. The importance of stratigraphy, however, is not ignored in the search for pre-Permian reserves.

What has brought about this shift in emphasis?

The answer is deep drilling and added subsurface knowledge. In the past, oil companies have geared their exploratory work to production above 10,000 ft. Ellenburger and the other pre-Pennsylvanian reservoirs were too deep except on the major uplifts. During the past few years all this has changed. Over 65 field wells are currently drilling for Ellenburger production below 12,000 ft.; at least half as many more wildcats are seeking new fields at 12,000 to 14,000 ft.

An entirely different type of geology underlies the Permian beds that cover West Texas. The simple pre-Permian structures with less than 100 ft. of relief become "young mountains" in the pre-Pennsylvanian beds. The unconformity that occurred prior to the deposition of the Permian in many instances completely obscures large oil fields. Rocky Mountain-type structures exist in West Texas and the complex structures of southern Oklahoma may have their counterparts in West Texas.



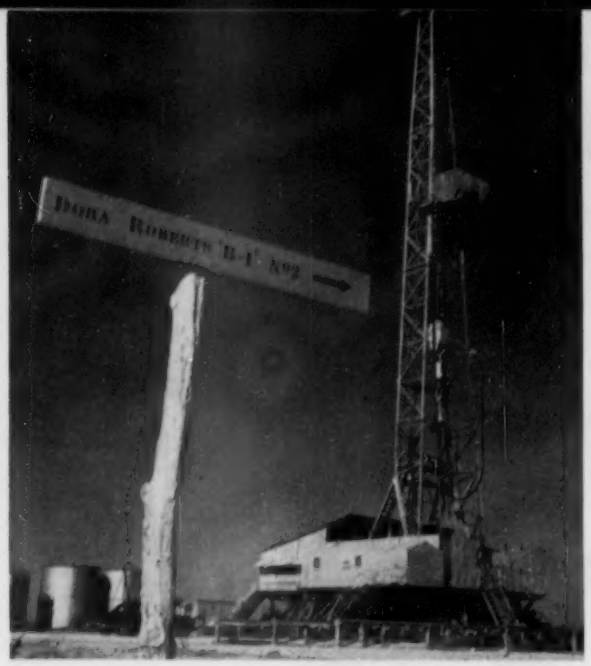
4. . . . is readily apparent from these cross-sections.

Much of the West Texas Ellenburger and pre-Pennsylvanian production so far has been closely related to Permian producing areas. Since many of the Permian structures have not had Ellenburger tests, this means that a vast Ellenburger producing potential probably underlies the Permian fields. Of course, all Permian fields do not overlie deep production, but many of them will eventually yield pre-Pennsylvanian oil. By the same token, geologists are aware that a Permian structure is not needed to insure pre-Pennsylvanian production.

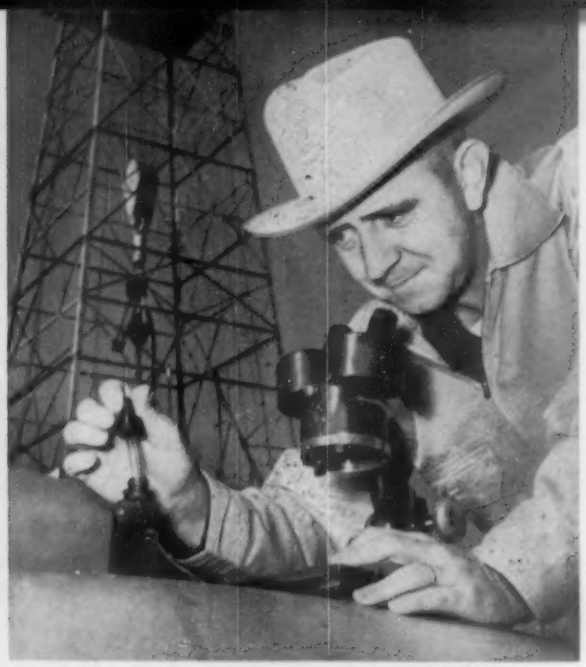
Ellenburger production . . . This formation is, and probably will remain, the most important pre-Pennsylvanian producing reservoir in West Texas. Of 70 Ellenburger fields, 10 per cent have already produced over 10,000,000 bbl. each (Table 4).

Apart from Crockett County, 85 per cent of the Ellenburger production is associated with shallow Permian fields (Fig. 1).

Pay thickness ranges from less than 100 to over 1,000 ft. of gross pay. Many operators use a rough rule of thumb to estimate Ellenburger reserves, based upon 75-100 bbl. per acre of



Ellenburger wells on the Dora Roberts trend have uncovered a major producing area, considered to be the most important West Texas strike in 1954.



Subsurface geology and sample running play an important part in locating new pre-Permian fields. Recent discoveries show that the value of seismic work is increasing.

recoverable oil per foot of gross pay.

If the above rule of thumb is correct, Headlee, Andector, TXL, Keystone, and Yarborough and Allen will eventually reach major field status by producing over 100 million barrels of oil.

The majority of Ellenburger fields have an active water drive and many of them have an erratic water table.

Many of the large Ellenburger fields have average pay thicknesses ranging from 140 to 380 ft. and were developed on 40-acre spacing. Certain of these fields have at least 700 ft. of pay above the oil-water contact. Oil companies now, however, are faced with locating and developing smaller low-relief structures at 10,000-14,000 ft. with less than 200 ft. of pay above the oil-water contact. Deep Rock field in Andrews County, for example, has less than 150 ft. above the water in the highest well drilled. This means that the low-relief structures with an average of only 75 ft. of pay are barely economic with estimated recoveries of only 300,000 bbl. per well on 40-acre spacing. Deep Ellenburger tests cost in the neighborhood of $300,000 or even more. Exploration, leasing, lifting costs, etc., are at least $1 per barrel. Thus total cost of developing a 40-acre tract exceeds $600,000. The net revenue at $2.77 per barrel is $725,000, after deducting the landowner's usual one-eighth oil payment. This is a net profit before interest charges and risk factor of less than 21 per cent on the total investment of $600,000.

Operators are developing many of these fields on 80-acre spacing to insure a reasonable profit on their very heavy investments.

Geology

During much of the pre-Pennsylvanian part of the Paleozoic era, West Texas was a depositional basin. Marine seas deposited a fairly normal sequence of beds over a large part of this broad region. As a consequence, the lithology of the pre-Pennsylvanian formations is fairly uniform and closely resembles that of southern Oklahoma (Table 1).

The Ellenburger formation is the most important oil reservoir from an economic viewpoint, but Simpson, Fusselman, and Devonian zones produce in many fields; locally the Montoya is productive.

Cambrian . . . Except in West Central Texas where it produces, the Cambrian has received little attention in the subsurface. On the Llano uplift, it is divided into two formations, the lower Riley and the overlying Wilberns. Some

TABLE 1—GENERALIZED PRE-PERMIAN STRATIGRAPHIC COLUMN FOR WEST TEXAS*

ERA	SYSTEM	SERIES	GROUP	FORMATION			LOCALIZED	
PALEOZOIC	PENNSYLVANIAN		CISCO	PUEBLO HARPERSVILLE THRIFTY GRAHAM			CISCO	
			CANYON	CADDO CREEK BRAD GRAFORD PALO PINTO			McMILLAN "REEF LIME"	
			STRAWN	MINERAL WELLS GARNER MILLSAP LAKE			"CRINOIDAL" REEF LINE	
			BEND	SMITHWICK MARBLE FALLS			BEND LIME	
	MISSISSIPPIAN		MISSISSIPPIAN	"MISSISSIPPIAN LIME"			MISSISSIPPIAN	
	DEVONIAN		HUNTON	WOODFORD SHALE				
				PERCHA	UPPER HUNTON	UNIT 6 UNIT 5 UNIT 4	DEVONIAN	
				CANEY & LG	MIDDLE HUNTON	UNIT 3 UNIT 2		
	SILURIAN			FUSSELMAN	LOWER HUNTON	UNIT 1	SILURIAN	
	ORDOVICIAN	CINCINNATIAN	UPPER ORDOVICIAN	MONTOYA			MONTOYA	
		CHAMPLAINIAN	SIMPSON (MIDDLE ORD.)	BROMIDE TULIP CREEK McLISH OIL CREEK JOINS			McKEE-CONNELL WADDELL-SHARP	SIMPSON
		CANADIAN	ELLENBURGER	UNIT 3 UNIT 2			ELLENBURGER	
	CAMBRIAN			UNIT 1	BASAL ELLENBURGER SS CAMBRIAN SS			
PRE-PALEOZOIC	PRE-CAMBRIAN	LLANO	PRE-CAMBRIAN BASEMENT	PRE-CAMBRIAN UNDIFFERENTIATED			"GRANITE"	

*After Troutman (adapted from Gardner, Sellards, Cheney, King, Midland Geological Society, and others).

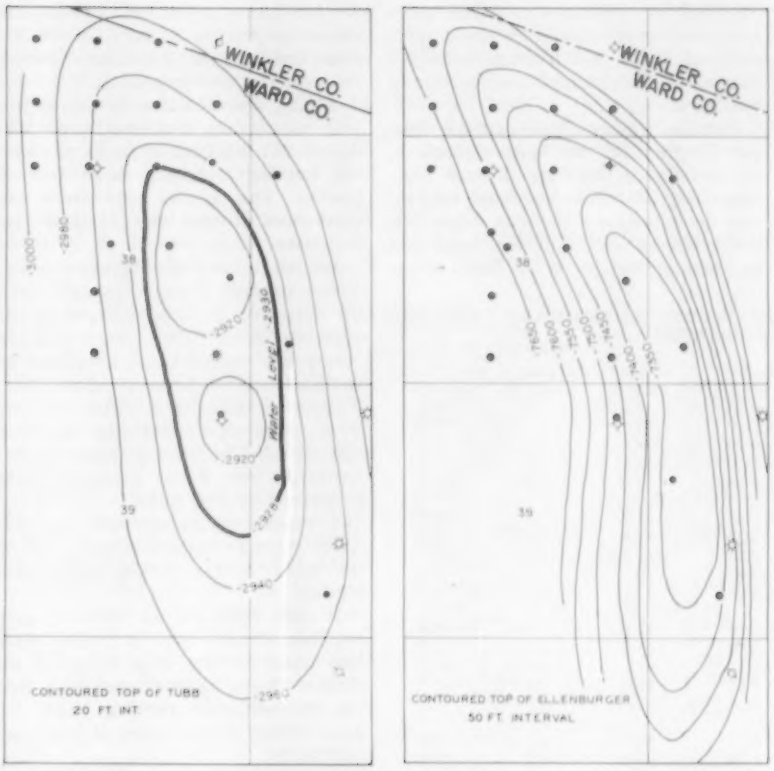


Fig. 5—Monahans is only one of many Ellenburger fields associated with Permian production. Observe that the 60 ft. of Permian relief (left) increases to over 350 ft. below the unconformity (right).

wells on the southeast end of the Central Basin platform have penetrated 125 ft. of standstone and shale between the Ellenburger and the pre-Cambrian.

Ordovician . . . The Ellenburger formation covers a wide area in West Texas, and is a prolific oil reservoir. Its thickness varies from a feather edge in Gaines County to about 1,800 ft. at the outcrop on the Llano uplift.

The producing zone normally consists of a fractured, locally very porous dolomite or dolomitic limestone (Fig. 2). Because of the fracturing, the porous zones are interconnected and the Ellenburger is considered a single reservoir in each of the producing areas. Several fields produce from the Ellenburger at or very near the unconformity surface. The producing area is formed by topographic closure on the old Ellenburger land surface. Apco in north central Pecos County is a good example of this type of field.

Correlations within the Ellenburger are difficult in the subsurface. The formation is about 1,700 ft. thick in Crockett County, but thins to the northwest. It is absent in northern Gaines County and at Cass field in Lea County, New Mexico, where Simpson beds rest directly upon the pre-Cambrian.

Middle Ordovician . . . Sands in the Simpson group are present on many West Texas structures and three of these sands produce oil: the Connell, Waddell, and McKee.

The Simpson section resembles that of Oklahoma, although the West Texas sands thus far have not been so prolific largely because they are not so well developed. The Simpson reaches a maximum thickness of 2,000 ft. in Pecos County, but thins to the northwest and is only about 650 ft. thick in southern Andrews County. It is missing in northern part of Midland basin.

Upper Ordovician . . . The Montoya, characteristically, is a brown siliceous somewhat argillaceous limestone that contains smoky spicular chert. It has been correlated with the Viola and Fernvale of Oklahoma and is best developed in central Winkler County where it is over 400 ft. thick. Although it does produce oil locally on the Central Basin platform, it is not considered a worth-while primary objective by most geologists.

The Sylvan shale, although not important economically, is a very useful subsurface marker. It is an olive greenish-gray shale that is correlative with the Sylvan of Oklahoma. It seldom exceeds a thickness of 50 ft. and usually is only 20-30 ft. thick.

Silurian . . . The Silurian portion of the Hunton of the Mid-Continent is present in West Texas. The Fusselman probably correlates with the Chimneyhill portion of the Hunton and was originally designated Chimneyhill. Although the Fusselman produces oil on many structures in West Texas, it is not a prolific reservoir.

Devonian . . . Next to the Ellenburger, Devonian rocks are the most important pre-Pennsylvanian reservoir in West Texas. Locally the formation can be subdivided, especially in the southeastern part of the Central Basin uplift. In places, the Devonian is very cherty and affords considerable trouble while drilling. It is a limestone-and-chert unit that probably corresponds to the upper parts of the Hunton of Oklahoma. Differentation between the Silurian and Devonian is difficult at times based on sample identification alone.

The lower Devonian limestone section can be divided into four units in parts of West Texas; the upper three units can be mapped and locally are useful subsurface markers.

In northern Andrews and Gaines counties, the siliceous limestones and cherts become the typical crystalline Siluro-Devonian dolomite. In this area, the Devonian is the most important pre-Pennsylvanian drilling objective because the Ellenburger thins and is missing in northern Gaines County.

Many fields produce from the Devonian in West Texas. In parts of West Texas, the zone is commercial, but operators are skeptical about Devonian production in certain of the producing areas. TXL, however, has produced over 36 million barrels of oil from the Devonian reservoir since its discovery.

Much remains to be learned about the characteristics of the Devonian producing zones. Locally the porosity development is erratic and dry holes offset producers.

Several fields produce Devonian oil along the flanks of the structure at the pre-Permian unconformity, because the Devonian has been stripped off the crests of many of these larger structures. Block 11, Dollarhide, and Three Bar fields produce from eroded Devonian beds, to name only a few.

Upper Devonian beds are unimportant commercially, although the Woodford serves as a convenient subsurface marker. Some geologists assign the Woodford to the Mississippian rather than the Devonian.

Younger pre-Pennsylvanian beds . . . Although Mississippian beds produce oil in West Texas, they are less important than the Ellenburger and Devonian. These beds have been eroded from the crests of most large West Texas anticlines.

Structural history . . . The major structural elements of West Texas were apparently unimportant during pre-Pennsylvanian deposition. There is some evidence of unconformities and periods of erosion during this time, but these are not significant compared to the Pennsylvanian uplift.

During Pennsylvanian time, West Texas topography was transformed. The Central Basin platform became a positive area and for the first time the Midland and Delaware basins came into existence. This period of pronounced uplift and folding formed many of the present-day producing structures.

Erosion during Pennsylvanian time cut deeply into the larger anticlines, particularly on the Central Basin platform (Fig. 4). This erosional interval and the subsequent Permian deposition has obscured much of the local and regional geology of West Texas. Most of the more prominent known anticlines are usually reflected in the Permian beds because of continued growth, rejuvenation or compaction.

During Permian time marine deposition took place over much of West Texas. On the Central Basin platform, the familiar carbonate facies was deposited. This grades into shales and sandstones toward the Midland and Delaware basins.

Intense folding during the Pennsylvanian orogeny occurred in many areas of West Texas, especially along the west side of the Central Basin platform where pre-Pennsylvanian structures are sharply folded asymmetrical anticlines, frequently associated with faulting. These lines of folding can be recognized from Lea County, New Mexico, southeast into Pecos County, Texas, a distance of 150 miles.

Cross-sections through many of these fields strongly suggest compression as the origin of the folding rather than tension.

If these folds are the result of compression, several lines of folding probably exist on the west flank of the Central Basin uplift. Subsurface data and the numerous Permian fields that may reflect deeper folds support this conclusion.

TABLE 2—GENERAL CHARACTERISTICS OF CRUDE OILS PRODUCED FROM THE ELLENBURGER FORMATION*

Field and county—Color—	Sulfur (wt. per cent)	Gravity, °A.P.I.	Pour point, °F.	Vol. per cent gasoline and naphtha†
Andector, Ector—Brownish green	0.22	43.2	<5	34.9
Barnhart, Reagan—N.P.A. No. 7	<0.10	41.7	<5	37.0
Benedum, Upton—N.P.A. No. 2	<0.10	54.4	<5	56.6
Big Lake, Reagan—N.P.A. No. 7	0.20	44.7	<5	37.8
Big Lake, Reagan—N.P.A. No. 1½	<0.10	72.4	<5	‡95.0
Block 31, Crane—Brownish green	0.14	45.8	<5	36.1
Dollarhide, Andrews—Brownish green	0.23	41.5	<5	31.6
Embar, Andrews—Green	0.24	42.6	<5	40.2
Fullerton, Andrews—Greenish black	0.47	39.0	<5	30.6
Jordan, Ector—Brownish green	0.28	43.1	<5	34.5
Kermit, Winkler—N.P.A. No. 7	0.19	41.9	<5	30.0
Keystone, Winkler—Brownish green	0.18	43.8	<5	32.6
Monahans, Winkler—Brownish green	0.16	47.2	<5	37.7
Pegasus, Upton—N.P.A. No. 4½	<0.10	53.0	<5	46.3
Penwell, Ector—Dark green	0.24	42.7	<5	32.3
Sand Hills, Crane—Greenish black	0.22	44.7	<5	34.8
Todd, Deep, Crockett—N.P.A. No. 8	0.32	41.3	<5	36.2
TXL, Ector—Brownish green	0.19	44.1	<5	33.7
TXL, Ector—Greenish black	0.19	40.9	<5	31.0
Shafter Lake, Andrews—Greenish black	0.27	41.3	<5	32.4
University-Waddell, Crane—Green	0.13	44.9	<5	35.7
Yarborough & Allen, Ector—Greenish black	0.19	40.9	<5	30.8
Average	0.20	45.2		35.8

*Data supplied by U. S. Bureau of Mines. †Straightrun gasoline and naphtha to approximately 390° F. ‡Condensate type; omitted from average.

TABLE 3—ESTIMATED ANNUAL PRODUCTION OF OIL AND CASING-HEAD GAS FROM THE ELLENBURGER FORMATION—TEXAS RAILROAD COMMISSION DISTRICTS 7-C AND 8, AND SOUTHEAST NEW MEXICO

Year	No of wells at year end	Estimated annual oil production (bbl.)	Estimated annual casing-head gas production in M.c.f. at 14.65 psia. and 60° F.
1928	1	27,082	488,000
1929	3	920,801	9,200,000
1930	7	2,736,384	24,600,000
1931	9	6,579,976	49,350,000
1932	12	5,297,160	31,800,000
1933	18	3,849,257	19,250,000
1934	19	2,200,369	9,900,000
1935	19	1,491,873	6,000,427
1936	16	894,842	3,271,358
1937	18	966,492	3,042,261
1938	20	862,936	2,525,812
1939	25	783,599	2,016,715
1940	30	734,829	1,576,368
1941	66	897,156	1,650,969
1942	120	1,491,777	2,207,008
1943	173	2,419,265	3,116,406
1944	227	4,800,277	6,391,770
1945	313	10,829,454	15,839,557
1946	526	23,770,466	31,373,109
1947	736	37,290,608	44,207,927
1948	920	49,739,744	56,335,411
1949	1,028	41,461,111	48,587,510
1950	1,137	41,573,038	48,973,776
1951	1,256	54,318,182	65,702,560
1952	1,385	54,525,046	68,239,196
1953	1,490	56,008,320	66,858,615
Total through Dec. 31, 1953	1,490	406,470,044	622,504,755

Delaware basin . . . Oil men have long regarded the Delaware basin as the last exploration frontier in Texas. Actually little is known about its pre-Pennsylvanian possibilities because of meager well control. The basin is deep, with only shallow Permian sand production to encourage oil companies thus far. Comparison with other basins, however, gives promise for large future reserves, although the cost of developing them will be high.

Deep production is expected in the center of the basin, although at the moment the best prospective areas appear to lie along the rim of the basin where the Ellenburger is within reach of the bit. In the center of the basin, Ellenburger production is expected below 18,500 ft.

Gulf Oil Corp. 1 Northrup, deepest well ever drilled in Texas, has reached 18,090 ft. without penetrating the Devonian, expected at about 18,500 ft. Gulf's 1 Toyah Unit, a recent gas discovery in the Delaware basin, topped the Ellenburger at 14,713 ft. This well had gas shows in the Ellenburger, but was plugged back and completed in the Silurian for a calculated 65,000 M.c.f. of gas per day.

The Delaware basin with its 10,000 sq. miles essentially untested is a fertile area for prospecting and many oil companies are active in this part of West Texas.

Central Basin platform . . . Although

numerous large fields have been found on the Central Basin platform, the province has not reached maturity as a pre-Permian oil province.

The uplift has been actively explored for years because of the shallow Permian production and the Ellenburger possibilities at drilling depths of less than 10,000 ft.

The geology of the Central Basin platform is complex, involving both uplift and compression. Here again, the simple low-relief Permian structures conceal prominent anticlines with as much as 1,000 ft. of productive closure.

Large Ellenburger fields have been discovered either by drilling deeper in known Permian producing areas or by isolating a subsurface lead with seismograph.

The uplift closely resembles some of the larger known surface features such as the Big Horn Mountains of Wyoming. The Powder River and Big Horn basins are counterparts of the Midland and Delaware basins. The Big Horn Mountains, however, have been stripped of their Paleozoic sediments by erosion. In West Texas, these beds have, for the most part, been preserved under the Permian cover.

Midland basin . . . Hottest area in West Texas today is the west side of the Midland basin where oil companies are trying to locate another Dora Roberts trend. Thus far the fields discovered appear to be related to the Central Basin platform and parallel this major feature.

Pre-Pennsylvanian beds are encountered below 10,000 ft. in much of this part of the Midland basin. Midland Farms, Pegasus, and the other known fields, however, indicate that large structures exist and justify expensive exploration programs.

The Midland basin is an asymmetrical structural depression, developed during the Pennsylvanian orogeny. Its west limb dips fairly steeply from the Central Basin uplift; the east limb rises gently toward the border counties of West Central Texas. On the west side of the basin, Ellenburger production occurs at 13,500 ft., but on the east side in Coke and Nolan counties, the same zone produces at 6,000-6,500 ft.

Several large fields have been discovered on the west side of the Midland basin; present data indicate that some of these folds extend for many miles in the subsurface. It is reasonable to conclude that several lines of folding exist that will eventually produce. Detailed seismic work will extend many of the known trends and find local closures that may rival the original discoveries.

Pre-Pennsylvanian producing areas in West Texas range from stratigraphic traps to overturned or faulted anticlines like Keystone and Andector.

Although each field may differ from its neighbor, the production is very closely related to the regional geology and the major structural elements. As a consequence, these fields for the most part parallel the regional uplifts.

Most of the large Central Basin platform fields are elongate, asymmetrical anticlines, often associated with faulting. In general, the major faulting parallels the axial trend and occurs on the steeply dipping flank of the structure. Excellent examples of this type are Keystone, Todd Deep, Andector, Dollarhide, and TXL, to name only a few.

TABLE 4—IMPORTANT ELLENBURGER PRODUCING FIELDS OF WEST TEXAS*

Field—	Approximate depth to prod. zone	Ellenburger discovery dates	Cum. prod. through 1-1-54	Prod. area, 9-1-54	No. of wells
Andrews County:					
Andrews Northeast	13,800	4- 4-53	141,967	240	3
Bedford	11,000	11- 1-45	2,871,783	800	7
Block 12	10,800	4-23-52	652,048	720	18
Block 12, E.	10,100	10- 2-53	15,950	600	4
Block A-34	13,200	3- 6-54			1
Deep Rock	12,200	2-20-54			3
Dollarhide	10,000	10-22-47	9,191,567	1,800	45
Embar	8,000	5- 1-42	12,092,795	1,920	24
Emma	12,300	10- 6-53	28,474	400	5
Fasken	12,600	10-12-53	18,054	80	1
Fuhrman-Mascho	11,900	9-10-46	2,859		1
Fullerton	9,900	11-17-45	2,090,738	200	5
Fullerton, S.	10,600	2-20-48	4,607,069	800	19
Magutex	13,800	5-16-52	144,984	200	8
Martin	8,900	2-27-46	15,232,908	1,767	45
Midland Farms	12,600	9-24-52	434,354	800	14
Nelson	10,300	5-15-46	2,254,994	560	14
Prichard	13,500	10-28-53	5,388		1
Shafter Lake	11,700	11-22-48	3,014,142	450	10
Triple "N"	12,500	2-18-52	795,363	1,120	13
Wemac	13,300	1- 8-54			3
Crane County:					
Block 31	10,300	11- 7-45	3,551,453	1,360	17
Gulfstano	11,900	8-16-53	16,203		1
Jordan	8,900	2-21-47	6,276,903	2,360	59
Lea	8,200	6-10-53	67,268	560	14
Sand Hills (Ord.)	6,000	2-19-36	4,968,257	920	23
Sand Hills, W.	5,600	4-27-37	504,978	160	4
Univ. Waddell	10,600	5-13-47	4,745,380	1,120	13
Ector County:					
Andector	8,500	9-19-46	33,160,907	4,960	124
Couden, S.	12,900	3-26-54			1
Goldsmith	9,500	8-15-47	569,818		2
Goldsmith, N.	9,000	1-25-54		320	4
Headlee	13,100	1- 6-53	574,676	1,200	15
Penwell	8,900	4-10-46	408,230	560	14
TXL	9,600	5- 2-45	72,669,779	4,840	121
Yarbrough-Allen	10,400	9- 5-47	9,098,302	2,400	60
Gaines County:					
Flanagan	12,100	1- 8-49	257,368		1
Robertson	11,900	1- 1-50	137,805		2
Winkler County:					
Emperor		1954			1
Kermit	10,700	4-25-43			3
Keystone	9,500	6- 6-43	66,490,932	7,200	180
Monahans	10,500			2,140	5
Wheeler	10,700	6-16-42	12,172,505	3,057	34
Wright Ranch	11,500	6-24-52			1
Midland County:					
Pegasus	12,750	3- 1-49	18,760,684	8,880	111
Sweetie Peck	13,100	2-24-50	2,164,977	1,100	15
Upton County:					
Davis	13,100	11-29-50	22,837		1
Wilshire	12,000	4-12-51	4,361,342	1,720	43
McCamey	7,900	5- 8-48	88,372	40	1
Reagan County:					
Big Lake, W.	9,400	2- 3-53		200	5
Barnhart, S.	9,000	6-17-52	25,176		1
Crockett County:					
Midway Lane	7,500	7-24-47	3,799,196	880	22
Elkhorn	7,100	6-29-51	912,050	2,000	50
Todd	6,000	2-27-45	18,653,366	2,600	65
Block 39	8,100	6-30-47	7,892		
Childress	8,000	3-23-48	7,490		
Clayton Ranch	8,400	6-13-50			
Alma Cox	7,300	3-27-51			1
Reagan County:					
Barnhart	8,900	9- 1-41	12,021,051		
Big Lake	8,500	12- 1-28	110,514,871		165

*Several of these fields are still being developed and the producing area is still expanding.
†January 1, 1953.

Several of these fields have drilled repeated sections on the steeply dipping flank, indicating possible overturning or thrust faulting. The fault planes are steep, probably approaching vertical, and the horizontal movement undoubtedly is negligible.

In the Midland basin, some of the largest folds are in the deepest part of the basin, e.g., Wilshire, Pegasus, and others.

Pre-Pennsylvanian Exploration

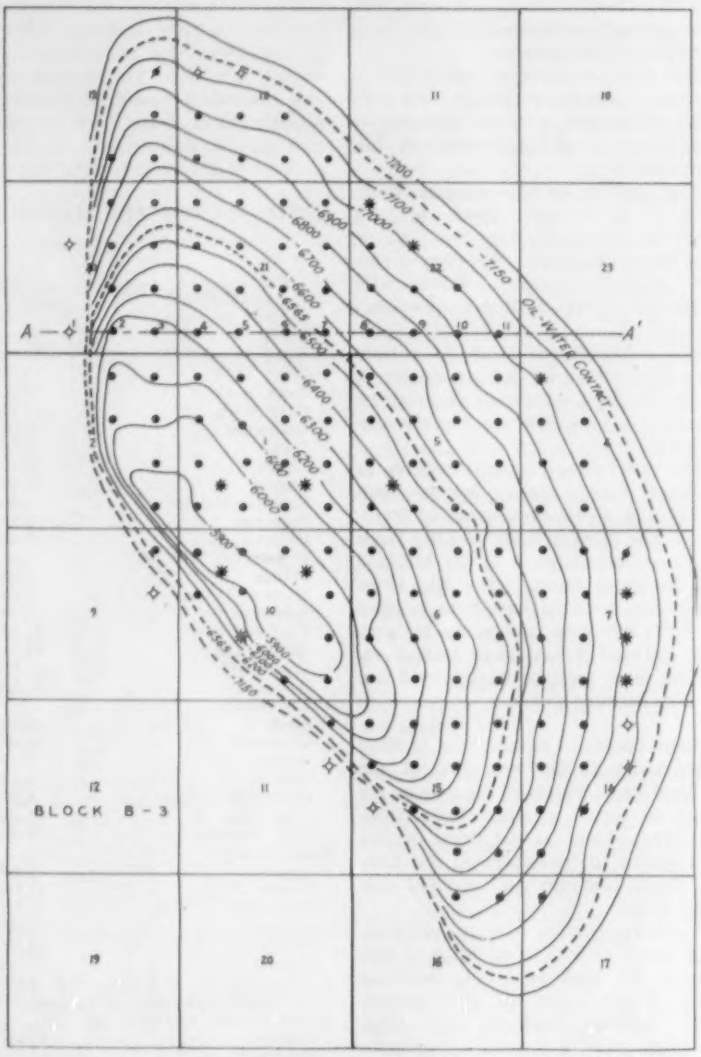
Subsurface geology coupled with seismic work is the most effective means of locating pre-Pennsylvanian oil fields. Oil companies have been very successful in locating Devonian production with the seismograph. Of the 45 principal Devonian fields, nearly half have been discovered by seismic surveys and are not related to overlying Permian production. Twenty-four Devonian fields are associated with Permian production and many of these fields also produce from the Ellenburger.

Oil companies normally isolate a subsurface lead by well control, regional geology, and geological interpretation. Detailed shooting serves to pinpoint the prospect and delineate the structure.

Most seismic shooting is carried out using reflection work. Closed loops help to eliminate possible errors that may arise from the continuous correlation method of mapping. Very careful attention is paid to velocity control, because rapid changes in velocities occur in short horizontal distances. Experience has shown that these velocity changes may show apparent structures or anomalies that do not exist; they may even mask structures that are present.

Many seismologists use the Devonian reflections for mapping purposes and consider the Devonian to be a reliable subsurface and seismic horizon. Frequently, however, no reflections are obtained below the Mississippian, but mappable data come from the Pennsylvanian. Fortunately, oil companies tested these shallower structures and found either Devonian or Ellenburger oil on several of the leads.

From a geologist's point of view, the Devonian datum is not entirely satisfactory. In many areas, particularly in the Central Basin platform, the Devonian is an erosional surface and in direct contact with the overlying Permian. As a consequence, the seismic work is mapping topography rather than structure, or as often happens, a combination of topography and downdip structure. Early shooting in Oklahoma was done using the Hunton as a marker. This work resulted in many dry holes because the seismic surveys failed to map the low-relief Simpson structures in Central Oklahoma. Geo-



Keystone has an oil column of 585 ft. and an estimated ultimate recovery in excess of 100 million barrels from the Ellenburger formation.

Keystone Ellenburger Shows the Problems

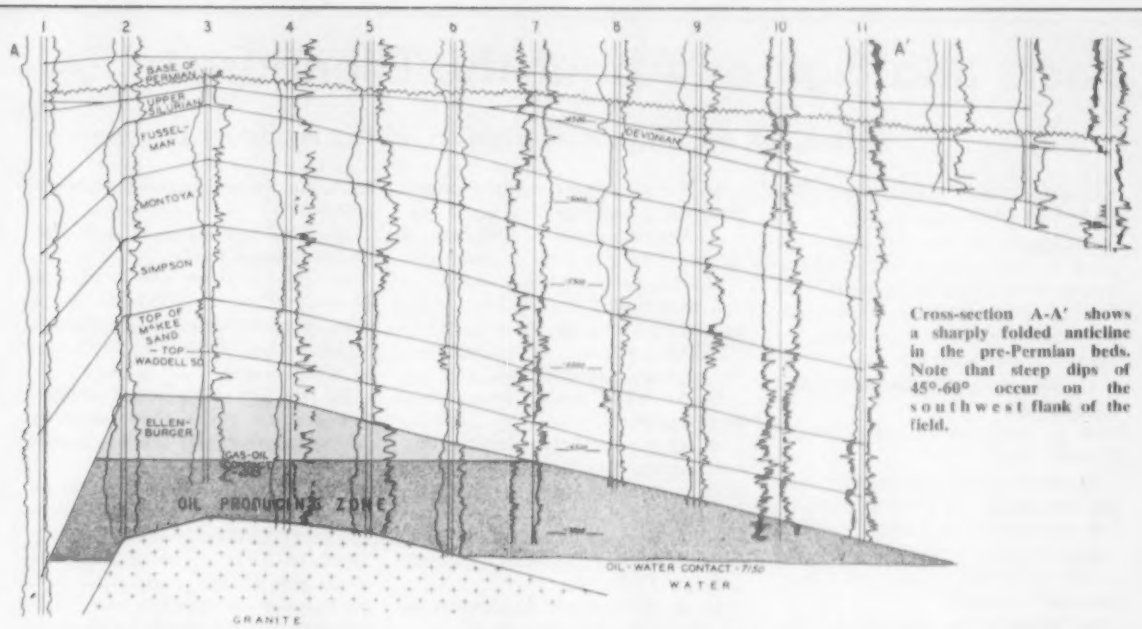
KEYSTONE in north-central Winkler County is an important link in a chain of pre-Permian fields that extends from Lea County, New Mexico, to Pecos County, Texas.

Ellenburger production at 9,500 ft. was discovered at Keystone in June 1943, and since that date this zone has produced over 66 million barrels of oil from 7,200 acres. The field has 2,160,000 acre-ft. of Ellenburger pay and may ultimately produce over 150 million barrels of oil.

Devonian beds produce along the north and east side of the field where they are present. These rocks have been stripped off the crest of the structure by Pennsylvanian erosion.

Geology

Keystone is typical of many of the large Ellenburger structures because it is weakly reflected in the overlying Permian beds as a low-relief anticline. In the pre-Permian field, however, the structure becomes a complex, sharply folded asymmet-



Cross-section A-A' shows a sharply folded anticline in the pre-Permian beds. Note that steep dips of 45°-60° occur on the southwest flank of the field.

rical anticline with over 1,300 ft. of relief. Wells on the west side of the field have logged dips of at least 60°. The Continental Oil Co. 1-B Walton crossed a thrust or reverse fault and encountered Simpson beds for the second time after drilling a short Ellenburger section.

Keystone lies on the west side of the Central Basin platform and, like the majority of the large Ellenburger fields, appears to be closely related to this regional feature.

Seismic Problems

Mapping a structure as large as Keystone is not an easy task, even with present-day techniques. The Devonian, key seismic mapping horizon in many parts of West Texas, is missing on the crest of the structure. There would be a tendency on the part of an inexperienced interpreter to map either the unconformity surface over the crest of the structure, or even to insert a fault at the updip limit of the Devonian, 1½ miles northeast of the axis of the Ellenburger structure.

It is extremely difficult, if not impossible, to obtain a true seismic picture of the southwest flank of the field. The beds are dipping at 45°-60° and there appears to be a thrust fault with several hundred feet of throw. Seismometers would have to be at least 2-3 miles southwest of the field in order to map dips of 45°-60° at 9,000-10,000 ft.

Dip shooting appears to be a satisfactory method of delineating a structure like Keystone, assuming that satisfactory pre-Permian dip control can be obtained.

Mapping of many of the Ellenburger fields is further complicated by the development of reeflike structures on or above the unconformity separating the Permian and pre-Permian beds. At Todd field, Crockett County, the reef has 200 ft. of relief and has produced over 8 million barrels of oil.

Velocity problems . . . Anhydrite and salt complicate shooting in much of West Texas, causing rapid changes in velocity. These changes may result in the mapping of false structures or pseudo-anomalies unless adequate velocity control is available. Isopach maps can serve as a guide in areas where velocity control is not available. Pseudo-anomalies may appear as isopach "thicks" rather than "thins" if salt thicknesses are being mapped, rather than structure.

The Cretaceous limestones in parts of West Texas handicap seismic work. In the past, these areas have been considered unworkable. Improved techniques, however, such as multiple shot holes and geophones, now enable geophysicists to obtain usable information in these "hard-to-shoot" areas.

Seismic work is expensive, running $15,000 to $25,000 per month, but successes of the past have proved the value of this exploration method.

Drilling at Keystone was carried out using 40-acre spacing, but operators are turning to 80-acre spacing in developing the smaller and deeper Ellenburger fields.

Devonian chert is one of the problems facing operators in drilling for pre-Permian production. At Keystone, however, the Devonian is relatively thin. Many West Texas wildcat contracts carry a "chert clause" that permits the contractor to go on day rates after drilling chert for 24 hours.

Drilling techniques have steadily advanced in West Texas during the past few years. Thirteen-thousand-foot Ellenburger wells now are drilled in 60-70 days under favorable conditions; 2 years ago wells to this depth required 120-150 days. Large drill collars, large pumps, jet bits, and more powerful engines have been important factors in cutting drilling costs.

Production . . . Keystone, like so many Ellenburger fields, has an active water drive. Since the average pay thickness per well is 300 ft., many Keystone wells should eventually produce over 900,000 bbl. apiece.

Several of the newly discovered Ellenburger fields, however, are being developed on 80-acre spacing, since the 13,500-ft. tests may be uneconomic on usual 40-acre spacing.

Outlook . . . Recent developments indicate that several lines of folding exist on the west side of the Central Basin platform. The geology of the area is complex, and costs of exploration and drilling are high, but operators are looking with optimism to the west side of the Central Basin platform.

Facts and Figures About the Ellenburger . . .

. . . which will add to your information on this important oil reservoir

Q. Where did the Ellenburger first receive its name?

A. The term was originally applied to an outcrop in the Ellenburger Hills of southeastern San Saba County, Texas. It is now used to denote the Lower Ordovician limestone and dolomite section in Texas.

Q. Where was the first production established?

A. In 1928, at Big Lake in Reagan County, Texas.

Q. How many fields produce from the Ellenburger in West Texas?

A. There are 70 principal producing fields, but this number is constantly increasing as successful wildcats are completed.

Q. What is the cumulative production from present Ellenburger fields?

A. Approximately 406,470,044 bbl., as of January 1, 1954, from the West Texas fields.

Q. What recovery can be expected from the Ellenburger?

A. Operators use 75-100 bbl. of oil per acre per foot of gross pay thickness. Some fields undoubtedly will exceed this figure. Present recovery figures range from 7,500 to 50,000 bbl. per acre, depending upon the field and pay thickness.

Q. At what depths does Ellenburger produce?

A. This varies considerably, but ranges from 5,600 ft. at West Sand Hills to below 13,800 ft. at Magutex. Ellenburger gas at Puckett field, Pecos County, is as deep as 14,500 ft. Most of the current development is below 12,000 ft.

Q. Is Ellenburger production at 12,000-14,000 ft. economical?

A. Yes, if the producing area and oil column are large enough. Most operators consider that deep production on 40-acre spacing may be marginal and are developing the new fields on 80-acre spacing wherever possible.

Q. What is the cost of a 13,500-ft. Ellenburger test?

A. Field wells to this depth cost from $250,000-$350,000. Some wildcats have been considerably more expensive and a few have cost over $1,000,000 apiece.

Q. Has any Ellenburger production reached major field status by producing over 100 million barrels of oil?

A. Yes, Big Lake has produced over 110 million barrels since Ellenburger production was first established in 1928. Shallow pay was found first in 1923, but in 1928 first pre-Permian production in West Texas started the search for deep reserves that is still gaining momentum. TXL, in addition to Big Lake, has produced a combined total of over 100 million barrels from the Devonian and Ellenburger reservoirs.

physicists were apparently mapping either topographic highs or rapid variations in Hunton thickness as anomalies.

Close coordination between the geology and seismic efforts is the solution to locating new Ellenburger production. Where complex geology exists, dip shooting is a powerful tool in the hands of an experienced interpreter. Proper laying out of seismic lines is an absolute essential, otherwise faults may be crossed or structures missed entirely. Some of the largest fields are poor seismic targets because of the very narrow band of a steep dip that defines the producing area.

Dip shooting does not mean four-way shots at each section corner, or isolated cross-spreads to ascertain dip. The term is used in referring to continuous profiling with lines properly oriented and perpendicular to the regional or inferred structural trends. Shot holes must be closely spaced (i.e., less than 800 ft. apart) to insure mapping of faults or steep dip if the geology is complex. Cross-spreads are shot for dip control at every second shot point; strike lines are needed to tie the dip data together and to insure a more accurate interpretation.

After the geological data are plotted on the migrated seismic cross-sections, a sound interpretation is made based upon the seismic information and the local and regional geology. Maps are constructed, using either dip data, a phantom horizon, or a continuous reflecting horizon.

Seismic work until recently has been handicapped, because of large areas where the data were unusable. This was especially true in areas where the Cretaceous limestone was present such as the Edwards plateau.

Improved field techniques have enabled geophysicists to shoot these areas. Pattern shooting, multiple detectors, and the geograph are all proving their worth in West Texas today.

Mapping the quality of seismic reflections is another means of outlining prospects and extending known trends. This method works well in areas of steep dip where reflections are notoriously poor and correlations are difficult to follow.

Dip shooting outlined above is an excellent method for mapping sharply folded structures where faulting and steep dips occur. The Central Basin platform has many areas where this type of program will work successfully.

Continuous dipmeter . . . Locally, pre-Pennsylvanian beds show steep dip, although the regional Ellenburger dip is on the order of 500 ft. per mile in many areas, or 5°. The continuous dipmeter is an excellent tool for determining the dip of the beds as well as the strike. It should prove particularly useful along the west side of the Central Basin uplift where steeply dipping beds are present. This tool at the moment has not been used widely, but it is an inexpensive means of getting valuable subsurface information. Many oil companies consider dipmeter surveys as confidential and do not release the data. Trading dipmeter surveys, however, is an easy way for oil companies to acquire additional dip information.

Interpretation . . . The main problem for geologists in West Texas is the interpretation of the pre-Permian geology. In the past, West Texas production was largely from the Permian and was closely related to stratigraphy. Now, however, with the emphasis placed on Ellenburger production, the structural aspects have assumed the major role, although stratigraphy is still important. The Permian beds normally mask the complex pre-Permian structural patterns.

Three schools of geological thinking currently are in existence in West Texas concerning the structural aspects. The first considers that the Ellenburger structures are relatively simple with little or no faulting. The second recognizes the importance of faulting but considers that it is probably due to tension and uplift. The third school recognizes the importance that compression as well as uplift has played in the development of the Ellenburger

Q. How are Ellenburger fields discovered?

A. Subsurface geology and seismic surveys are the best method for isolating pre-Permian leads. Improved seismic techniques are largely responsible for the recent wave of successful wildcats.

Q. What is the present daily production from the Ellenburger formation?

A. 132,139 bbl.

Q. What is the daily average production from an Ellenburger well?

A. Production is closely controlled by the Texas Railroad Commission, but the majority of the deep ones produce at least 230 bbl. of oil per day.

Q. What counties produce Ellenburger oil in West Texas?

A. The main producing counties are Gaines, Andrews, Winkler, Ector, Midland, Upton, Crane, Ward, Pecos, and Crockett. The formation also produces in Lea County, New Mexico, as well as Texas counties along the Bend arch in North Texas. A total of 39 Texas counties produce Ellenburger oil, making this zone one of the most widespread in Texas.

Q. What is the average cumulative production per well to date?

A. At least 274,000 bbl. per well based on a survey of 1,500 wells. Of course, many of these wells will each ultimately produce considerably more than this figure.

Q. What are the principal Ellenburger fields?

A. The largest producers are Big Lake, TXL, Keystone, Andector, and Todd. Midland Farms, Pegasus, Wilshire, and Dollarhide are also key fields.

Q. What is the nature of the reservoir rock?

A. The Ellenburger reservoir is usually a fractured porous dolomite. The fractures play an important role in controlling production.

Q. What type of energy controls the Ellenburger production?

A. In general, the fields have an active water drive.

Q. What are the prospects for future Ellenburger production?

A. Excellent. Advances in seismic techniques coupled with the number of recent successful wildcats indicate that many new fields will be discovered in 1955 and 1956.

Q. What is the present price of Ellenburger crude?

A. $2.77 per barrel for 40° and higher gravity oil.

Q. What is the gravity?

A. Average gravity is 45° A.P.I. but ranges from 39°-54° A.P.I.

Q. Is the oil sweet or sour?

A. Sweet. The sulfur content averages less than 0.20 weight per cent.

Q. What is the market for West Texas oil?

A. The Gulf Coast, St. Louis and Chicago area refineries, and some eventually reaches the East Coast.

Q. Are other pre-Permian zones important oil producers?

A. Yes, 45 fields produce oil from the Devonian formation, a limestone and dolomite section. In Gaines County, where the Ellenburger is missing, the Devonian is an important primary target. In addition, the Montoya, Fusselman, and Simpson sands are important, as is the Pennsylvanian.

Q. How is the Ellenburger produced?

A. Most wells are completed flowing; initial potentials as high as 2,000 bbl. of oil per day are common.

fields and uses thrust or reverse faulting to account for many of the peculiarities observed.

These differences in opinion are a healthy sign, however, and represent progress in trying to interpret West Texas geology in the light of additional subsurface control.

Future Production

Large untested Ellenburger reserves underlie present Permian producing areas. Oil companies have not put forth an all-out effort to develop these areas, since the land is already held by production. They prefer to spend their exploration money in wildcat country and attempt to stay ahead of their competition in the untested areas.

Many of the larger structural trends probably will be extended. The Dora Roberts trend in Ector and Midland counties covers a distance of at least 14 miles. The Texas Co. 1 Ratliff, a recent Ellenburger discovery, may have picked up this fold 6 miles to the northwest. It is not improbable that many of the known fields are actually local closures on pronounced lines of folding. Experience in southern Oklahoma has shown that such folds can be recognized in the subsurface for 20-30 miles.

Production around large fields on the downthrown side of the major faults is an excellent possibility, especially if the throw of the fault exceeds the thickness of the Ellenburger. The fault may control Devonian or Simpson production, even if it fails to act as a barrier for Ellenburger oil.

Simpson sands, locally, may be worth-while primary objectives.

Oil possibilities in West Texas have never looked better. In the first 11 months of 1954, there have been 205 new discoveries and 641 dry holes for a success record of 24 per cent. The year 1955 will see a record wave of successful deep wildcats in West Texas.

References

Adams, J. E., et al. (1951), Starved Pennsylvanian Midland basin, A.A.P.G. Bull., Vol. 35, p. 2600-2607.

Adams, J. E., and Frenzel, H. N. (1952), Guidebook, 1952 Spring Field Trip, Marathon Basin, Brewster and Pecos counties, trans-Pecos Texas, West Texas Geol. Soc.

Bartram, J. G., Imbt., W. C., and Shea, E. F. (1950), Oil and Gas in Arbuckle and Ellenburger Formations, Mid-Continent region, A.A.P.G. Bull., Vol. 34, p. 682-700.

Blanchard, W. G., and Davis, M. J. (1929), Permian Stratigraphy and Structure of Parts of Southeastern New Mexico and Southwestern Texas, A.A.P.G. Bull., Vol. 13, p. 957-995.

Brodie, G. H., et al. (1949), Structure Study Group Symposium, Abilene Geol. Soc.

Brodie, G. H., et al. (1950), Geological contributions, 1950, Structure Study Group, Abilene Geol. Soc.

Cloud, P. E., Jr., Barnes, V. E., and Bridge, Josiah (1946), Stratigraphy of the Ellenburger Group in Central Texas—A Progress Report, Univ. Texas, Bull. 4301, p. 133-161.

Cloud, P. E., Jr., and Barnes, V. E. (1948), The Ellenburger Group of Central Texas, Univ. Texas, Bull. 4621.

David, Max (1946), Devonian (?) Producing Zone, TXL Pool, Ector County, Texas, A.A.P.G. Bull., Vol. 30, p. 118-119.

Denham, R. L., and Dougherty, W. E. (1941), "Sand Belt" Area of Ward and Winkler Counties, Texas, and Lea County, New Mexico, in Stratigraphic Type Oil Fields, A.A.P.G., p. 750-759.

Ellison, S. P., Jr. (1948), Apco Field, Pecos County, Texas, in Structure of Typical American Oil Fields, Vol. 3, A.A.P.G., p. 399-418.

Gardner, Frank J., and Phifer, Robert L., "The Oil and Gas Fields of West Texas, Part 1," published by Five Star Oil Report, Inc.

Giles, R. E. (1942), Payton pool, Pecos and Ward Counties, Texas, A.A.P.G. Bull., Vol. 26, p. 1632-1646.

Imbt, R. F., and McCollum, S. V. (1950), Todd Deep Field, Crockett County, Texas, A.A.P.G., Bull., Vol. 34, p. 239-262.

Jones, T. S. (1944), Dolomite Porosity in Devonian of West Texas Permian Basin, A.A.P.G. Bull., Vol. 28, p. 1043-1044.

Jones, T. S., et al., Stratigraphy of the Permian Basin of West Texas," West Texas Geol. Soc.

Rummerfield, Ben F., "Reflection Quality, a Fourth Dimension," Geophysics, Vol. XIX, No. 4, October 1954, p. 684-694.

Stevenson, F. V. (1945), Devonian of New Mexico, Jour. Geol., Vol. 53, p. 217-45.

Troutman, Arthur, "The Oil and Gas Fields of West Texas, Railroad Commission District 8," Vols. I and II, published by Five Star Oil Report, Inc.

West Texas Geological Society, "Stratigraphy of the Permian Basin of West Texas, "East-West Cross-Section Through Permian Basin of West Texas, 1949"; "North-South Cross-Section Through Permian Basin of West Texas (Platform), 1951"; "North-South Cross-Section Through Permian Basin of West Texas (Basin), 1953"; "Introduction to the Petroleum Geology of West Texas," Jan. 1951"; "Columnar Section, Pre-Permian Rocks, Central Basin Platform, 1946."

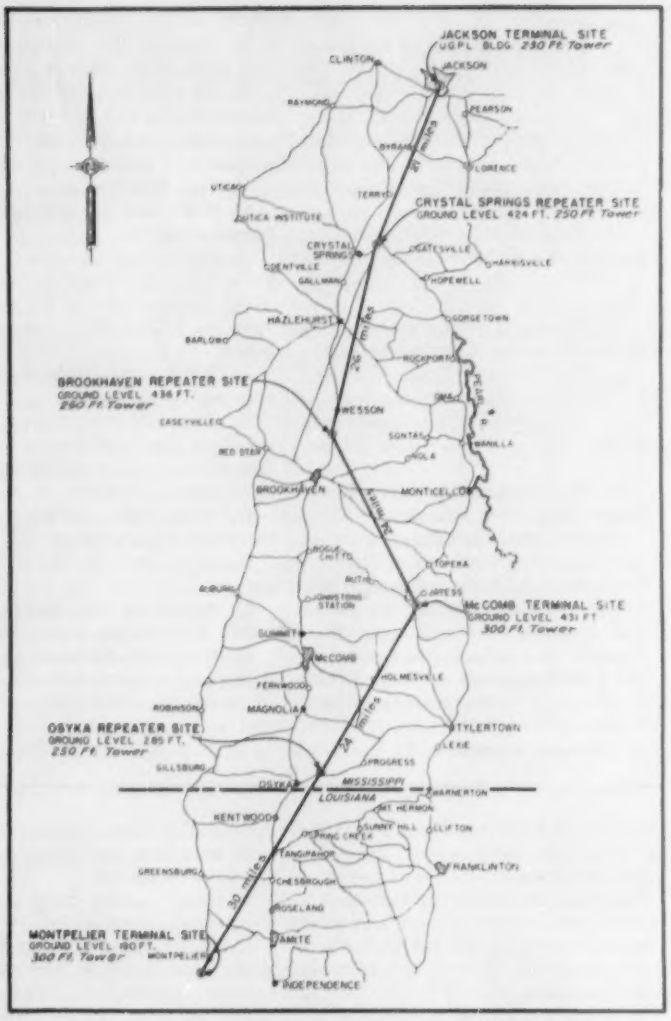
Here's proof of microwave reliability . . .

Propagation Tests Show "In-Time" Of 99.5 Per Cent

by E. D. Nuttall

UNITED GAS PIPE LINE CO. has installed a five-hop microwave system in Mississippi operating on 2,000 megacycles. The original purchase contract specified that the system should have a propagation reliability of 99.5 per cent for a 6-month test period and measurements made to date indicate that adequate fade margin has been provided to meet this requirement.

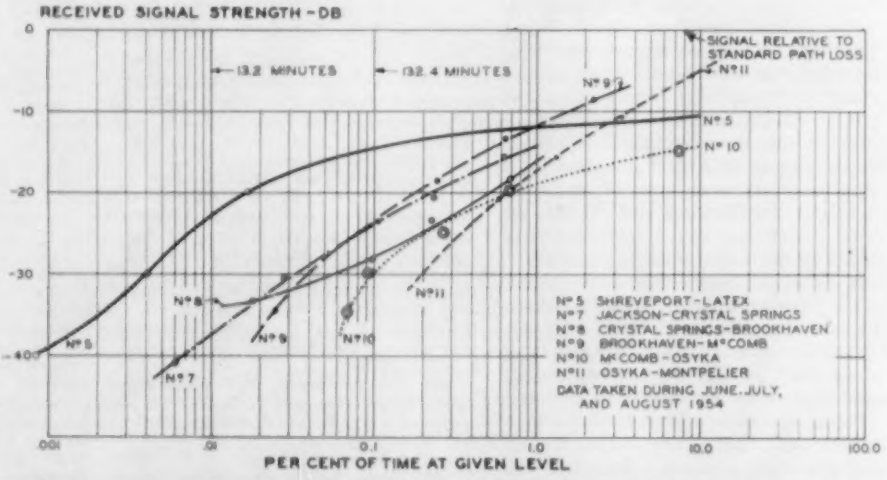
The system runs north and south with the northern terminal in Jackson, Miss., and the southern end near Montpelier, La. The map, Fig. 1, shows hop distances and tower heights. Critical path clearances throughout the system, based on 4/3 earth curvature, are about 150 ft. above ground elevation. Clearance to the 0 db. zone, (a factor used by the designer-manufacturer and equal to 0.6 first Fresnel zone), averaged about 75 ft. in the northern four hops but dropped to 25 ft. in the long hop from Osyka repeater to Montpelier terminus. Terrain coverage included thick, high trees, intermittent woods, cultivated land, and populated areas.



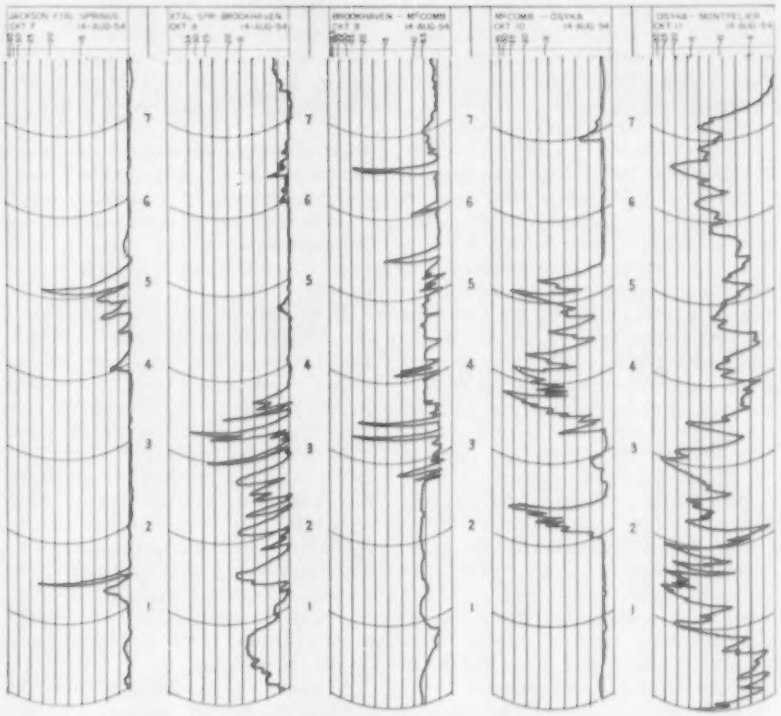
Route of United's microwave system in Mississippi and Louisiana. The system has consistently shown less than 0.5 per cent outage due to propagation fades. Fig. 1.

Propagation tests . . . Closely controlled propagation measurements were made on this system for the months of June, July, August, and September of 1954 and the results are given here. The official analysis of the entire test has not been completed although the information presented here is considered accurate. Propagation recorders were installed in limiter circuits on microwave receivers looking north at all stations except Jackson. Data from these recorders were used in plotting reliability

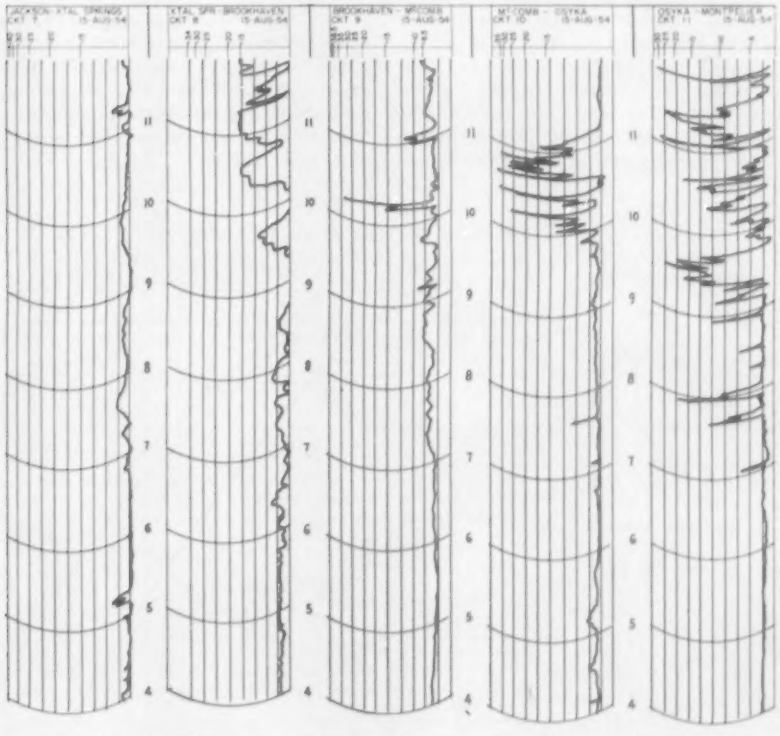
Author is electronics section supervisor, research department, United Gas Corp., Shreveport. Report presented to the Central Committee on Radio Facilities of the A.P.I.



Reliability curves for Jackson-Montpelier system and for Shreveport-Latex link. Last point on each curve represents actual dropout level although system was designed for nominal 30-db. margin. Fig. 2.



Fading is deeper and of wider extent progressing north to south. Fig. 3.



Fading tendencies are similar during both morning and evening. Fig. 4.

curves for each path; a composite of these curves is shown in Fig. 2. The curves were drawn from data averaged over the test period.

To obtain accurate data for determining the reliability of this system the transmitter power outputs were measured and the receivers were calibrated weekly. The receiver calibration method was designed to eliminate all but propagation losses and was done by means of a microwave signal generator, having a variable, calibrated attenuation pad, which fed into the first r.f. stage. Limiter current was read and correlated with various values of signal input and db. loss through the pad, resulting in a calibration curve on which limiter current was a direct measure of received signal level.

A normal receiver calibration showed from one to as many as three "humps" after limiter saturation was reached. Since we were interested only in the bottom or low ends of the curves, the measurement problem was somewhat simplified by using only that portion of the data. Consequently, a value, termed the "reference loss," was chosen well below the lowest of these humps and all subsequent propagation-recorder readings, after correction for average transmitter outputs for the week, were referred to that value. No readings were taken above this level since it could not be determined which hump the chart line was on.

A "normal signal" was found by checking each path several times under normal propagation conditions. This value was corrected for the transmitter output at the time and called "standard path loss." Since the difference between the reference loss and the standard path loss was known, the final tabulations were easily adjusted to refer to the standard path loss.

Deeper fades near gulf . . . A 3-month period does not provide a sufficient number of samples for conclusive data even when five paths are being sampled. Certain trends, however, may be noted from data taken over short periods of time. Continued observation of these trends would have to be made over extended periods before they could be termed conclusive. Two examples of one such trend are of interest.

Fig. 3 shows the fading prevalent over the entire system on August 14 between the hours of 12 midnight and 8 a.m. Note the duration and extent of the fading periods increases from north to south. In other words the closer to the Gulf of Mexico, the worse the fading becomes. Fig. 4 shows similar fading patterns which the system experienced on August 15 from 4 p.m. to midnight. A study of the charts was made to find fading patterns diammetrically opposite to those shown, but in this we were unsuccessful. Random fading, of course, occurred at times on all paths. However, study of the charts shows that when the entire area is suffering from a fading condition the depth and extent of the fade increases as one travels southward. Some day we hope

to be able to make weather correlations to support this hypothesis more conclusively. Spot checks on weather conditions indicate that fading such as that shown can be expected when there is a high water content in the air, and when the wind velocity is under 3 m.p.h.

Path geometry and probably weather conditions certainly must be taken into account when any type of propagation analysis is made. For example: the first four hops south of Jackson are through rolling, and for this area, highland country. Immediately south of Osyka the picture changes. You go from hilly to lowland country and have the longest hop of the system.

Another interesting propagation comparison can be made between the Jackson-Crystal Springs hop and the link between Shreveport and Latex, La. Figs. 5 and 6 are the path profiles. The reliability curves for the circuits are shown in Fig. 2. Both path profiles are plotted on the same 4/3 scale. The Shreveport-Latex path shows almost a 10 to 1 reliability improvement at the 30 and 40 db. points over the Jackson-Crystal Springs path.

The east and west distance between the paths geographically is about 250 miles and each path is about the same distance from the gulf. The weather, while not identical, is certainly similar. These are spot checks and trends perhaps, but certainly worthy of consideration is system planning.

Diversity reception . . . This is a good place to give results of a diversity test which was made in the gulf south area last year. M. O. Sharpe, of Trunkline Gas Co., has mentioned that diversity reception showed some possibilities of improving the propagation reliability of microwave paths according to some tests recently made on his company's system. These tests were conducted under the supervision of R. B. Hoffman, of the Federal Telecommunication Laboratories.

The tests were made between the stations at Moss Hill and Silsbee, Tex., on the Trunkline System, a distance of approximately 34 miles. The diversity antennas were located at Moss Hill and spaced 50 ft. apart vertically. Forty-four days of data were recorded and the results are plotted graphically in Fig. 7. Fades of 30 db. were seen by the upper antenna, 0.18 per cent of the time, while fades of 30 db. were seen by the lower antenna, 0.33 per cent of the time. Because of the time differential between the fades as seen by the two antennas the system saw fades of 30 db. only .025 per cent of the time.

A comparison between the Jackson-Crystal Springs path and the Shreveport-Latex path, which has the lower path clearance, showed a 10 to 1 better reliability figure for the latter. If we apply this same reasoning to the Federal diversity data, we find that the high antenna has a 2 to 1 better reliability factor than the lower antenna — the reasons for this apparent reversal of reliability versus antenna height will require careful study.

In crosschecking the reliability curves for the Federal test with our curve for Osyka-Montpelier we find that the reliability factor for the latter curve falls between the reliability factors for the two Federal curves. The Federal test is geographically about 50 miles south and 250 miles west of our Osyka-Montpelier test. The path direction is east and west, where our path direction is north and south. The respective tests are about the same distance away from the Gulf of Mexico.

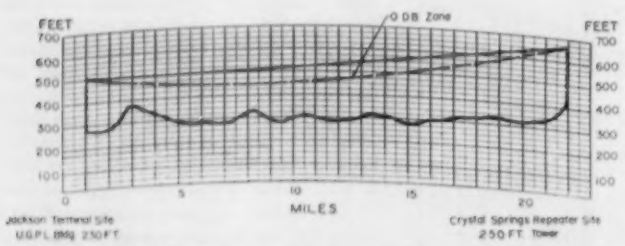
Importance of maintenance . . . Many authorities have emphasized the necessity for maintaining transmitter power outputs and receiver sensitivities at near optimum values if one wants to maintain a useful propagation reliability factor.

If we look at Fig. 2 we see that on the Osyka-Montpelier path a 10-db. equipment depreciation figure will reduce our operating margin .5 per cent. Multiply that by N number of hops with deep random fading and you might have operating troubles.

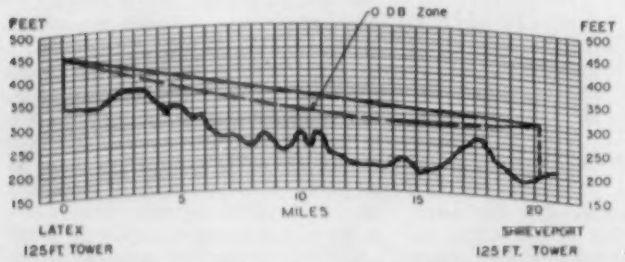
The data presented in this paper are not conclusive. Certain fading trends have been noted which should be helpful in future system planning. It has also been shown that propagation reliability figures in excess of 99.5 per cent can be achieved for the 2,000-megacycle band in the gulf south region by proper planning.

It has also been shown perhaps that rigorous equipment maintenance techniques are required if the reliable operating margins engineered into the system are to be retained.

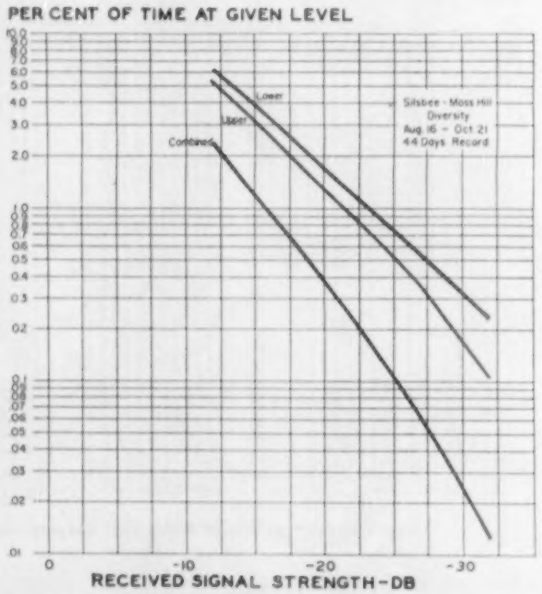
Any required degree of propagation reliability has to be engineered into the system at the very beginning and is an engineering problem. The component, equipment, and maintenance reliability requirements can be handled at any time with dollars.



Path profile of best link in Jackson-Montpelier system. Fig. 5.



Low-clearance path, running east and west, has best reliability. Fig. 6.



Reliability curve for Trunkline Gas Co. link between Silsbee and Moss Hill, Tex., where diversity reception gives considerably improved in-time. Fig. 7.

Fundamentals of Gas Lift—7

Intermittent vs. Continuous Flow

. . . which is more efficient in borderline cases?

by C. V. Kirkpatrick

A FOREMOST gas-lift problem is presented by the borderline well. That is, will the given well produce more efficiently by continuous flow or by intermittent flow? In analysis of continuous flow installations, the basic criterion for most efficient operations was that of theoretical adiabatic horsepower as determined by the optimum injection gas-oil ratio pressure. Therefore, in order to compare the intermittent flow design, it must be analyzed on the same basis.

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To demonstrate the method of analyzing the intermitting installation, a problem example utilizing data from an actual producing well will be solved, and the theoretical adiabatic horsepower requirements calculated.

Given:

Intermitting well installations with the following:

1. Depth of operating valve = 1,992 ft.
2. Pressure on casing = 515 psia.
3. Tubing pressure = 95 to 315 psia.
4. Production = 292 bbl. of total fluid per day.
5. Water-oil ratio = 2.56 to 1.
6. Gross gas-fluid ratio = 665 cu. ft. per bbl.; producing gas-oil ratio = 2,370 cu. ft. per bbl.
7. Productivity index = 0.5.
8. Gravity of oil = 31.4° A.P.I.
9. Tubing size = 2 in.
10. Tubing capacity = 3.87 bbl. per 1,000 ft.
11. Operating cycle = 10 minutes.
12. Fluid produced per cycle = 292/144 = 2.02 bbl. per cycle.
13. Operating liquid level in tubing = 1,140 ft.
14. Height of tubing slug = 1,992 − 1,140 = 852 ft.
15. Gravity of lift gas = 0.60.
16. Well-head temperature = 85° F.
17. Static fluid level = 1,000 ft.
18. Depth of well = 6,000 ft.
19. Shut-in bottom-hole pressure = 2,200 psia.

Estimate:

1. Theoretical injection gas-oil ratio.
2. Theoretical adiabatic horsepower for injection gas-oil ratio.
3. Actual injection gas-oil ratio.
4. Theoretical adiabatic horsepower for actual injection gas-oil ratio.
5. The amount of slippage or fall back of the liquid.
6. Operating efficiency.

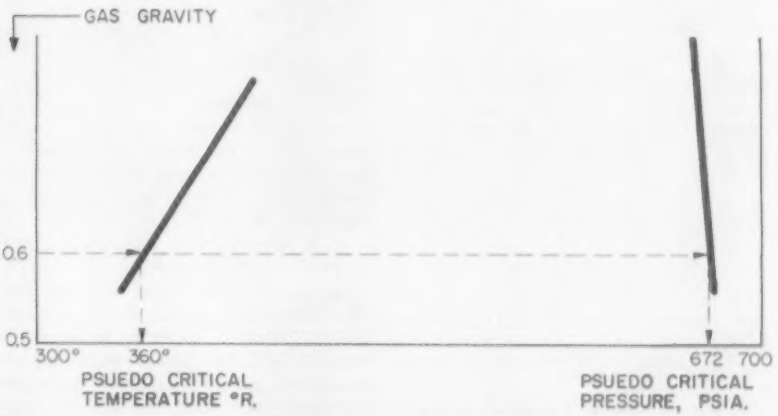


Fig. 1—The pseudocritical properties of natural gas may be determined for gas-lift calculations on charts of this nature. (After Katz-Oberfell-Alden).

Solution . . . The total volume of gas necessary to produce the slug of liquid is represented by the volume of the tubing from the surface to the injec-

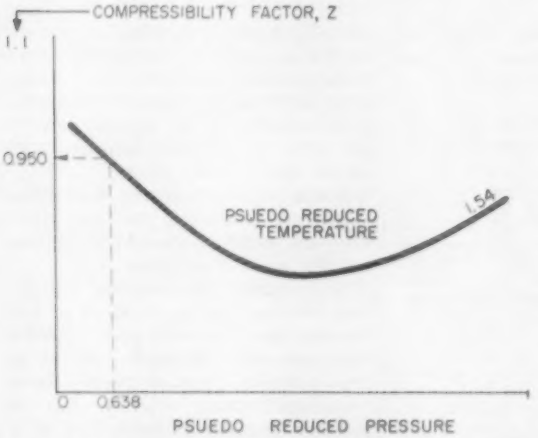


Fig. 2—The compressibility factor of natural gas as related to pseudoreduced conditions can be obtained on this type chart. (After Standing-Katz, A.I.M.E. Trans., 1942).

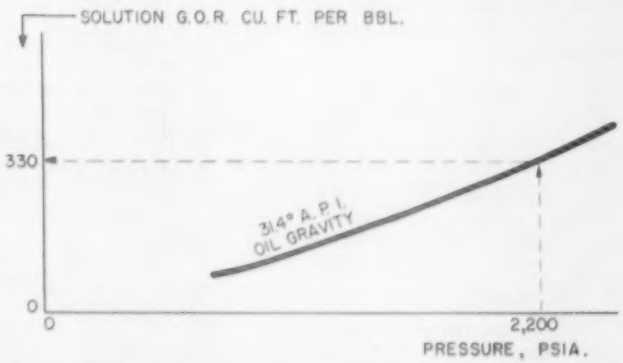


Fig. 3—Solution gas-oil ratio, as a function of oil gravity and pressure, can be determined from statistical average charts of this type which is specific to one temperature and gas gravity.

tion valve at the average pressure in the tubing from time valve opens until liquid slug clears the well head. The gas in the tubing above the slug need not be considered because it is automatically accounted for in that it is present before the operation starts and remains after the operation is completed.

Therefore, to compute the total amount of injection gas required per cycle in standard cubic feet per day:

$$\frac{Q_{G-c}\,P_A}{Z_A\,T_A} = \frac{Q_T\,P_T}{Z_T\,T_T}$$

or

$$Q_{G-c} = \frac{(Q_T\,P_T)\,(T_A\,Z_A)}{(P_A)\,(T_T\,Z_T)} \quad (1)$$

where:

Q_{G-c} = total gas required per cycle, cubic feet
Q_T = volume of tubing less the volume occupied by the liquid fall back
P_A = base pressure defining a standard cubic foot
T_A = base temperature defining a standard cubic foot
Z_A = gas deviation at P_A, T_A (to be taken as 1)
P_T = average pressure in the tubing
T_T = average temperature in the tubing
Z_T = gas deviation at P_T and T_T

To obtain Z_T, refer to a chart of the type shown in Fig. 1 and obtain the pseudocritical temperature and pressure. In this example they will be 360° R. and 672 psia. These relationships will be used:

$$P_R = P_T/P_C \text{ and } T_R = T_T/T_C$$

The subscript "R" is the reduced value, subscript "T" is the average value in the tubing, and subscript "C" is the critical value. P_T is the average pressure. Maximum pressure is the difference between the valve-closing pressure (490 psia.) and the differential across the valve (25 psia.) and, therefore equals 465.

$$P_T = \frac{465 + 315}{2} = 390 \text{ psia.}$$

$$P_R = 390/672 = 0.638$$

and

$$T_T = \frac{[70 + (1.6 \times 19.92) + 85]}{2}$$

$$= 93° \text{ F. or } 553° \text{ R.}$$

so

$$T_R = 553/360 = 1.54$$

Reference to a chart like that in Fig. 2 will show that Z_T for the above values is equal to 0.950.

Injection gas-oil ratio . . . From the known quantities of tubing volume, height of the liquid slug and volume of produced fluid, the quantity Q_T can be determined to be 36.50 cu. ft. Therefore:

$$G_{G-c} = \frac{36.50\ 390\ 520}{14.65\ 533\ 0.950}$$

$$= 960 \text{ cu. ft. per cycle}$$

Since 2.02 bbl. of fluid is produced per cycle, the theoretical injection gas-fluid ratio is:

$$G_l = 960/2.02 = 475 \text{ cu. ft. per bbl. of total fluid}$$

Since the water-oil ratio is 2.56 to 1, the oil produced per cycle is equal:

$$2.02/3.56 = 0.567 \text{ bbl. stock-tank oil per cycle}$$

Therefore, theoretical injection gas-oil ratio = 960/0.567 = 1,690 cu. ft. per bbl.

Horsepower Requirements

The theoretical adiabatic horsepower necessary to compress the injected gas from minimum well-head pressure to injection pressure may be calculated. From Equation 1 of Installment 4:

$$Hp. = \frac{P_{Ti}\,Q_T}{1 - K}\,[(P_{Ti}/P_W)^{(K-1)/K} - 1] \times \frac{144}{33{,}000\ 1{,}440} \quad (2)$$

where:

Hp. = theoretical adiabatic horsepower
P_W = minimum well-head pressure and other terms as previously defined
P_{Ti} = maximum injection pressure, psia.
Q_T = total gas in cubic feet per day at injection pressure P_{Ti} and injection temperature

After accounting for the pressure due to the weight of the column of gas in the casing, P_{Ti} becomes 515 + 25 = 540 psia. Remembering the oil produced is 82 bbl. per day:

$$Q_T = 1{,}690\ (14.65/540)\ (553/520)\ 82$$

$$= 3{,}990 \text{ cu. ft. per day}$$

and

$$Hp. = \frac{540\ 3.990}{(1 - 1.3)}\,[(540/95)^{(1.3-1)/1.3} - 1] \times \frac{144}{33{,}000\ 1{,}440}$$

$$Hp. = 10.75$$

Estimating actual gas-oil ratio . . . The actual injection gas-oil ratio is the producing gas-oil ratio less the gas in solution, and as the solution gas is unknown it must be estimated. Bottom-hole temperature is estimated as 150° F., and bottom-hole pressure is given as 2,200 psia. Now reference to Fig. 3 shows a solution gas-oil ratio of 330 cu. ft. per bbl. for a 31.4° A.P.I. gravity oil.

Therefore, the actual injection gas-oil ratio may be estimated to be 2,370 less 330, or 2,040 cu. ft. per bbl.

Corrected horsepower . . . All factors in the theoretical horsepower formula remain the same except for the injection gas-oil ratio; hence, horsepower is directly proportional to gas-oil ratio. Therefore, the theoretical adiabatic horsepower for the actual injection gas-oil ratio is equal:

$$\frac{2{,}040}{1{,}052}\,(10.75) = 12.99 \text{ hp.}$$

Amount of fall back . . . The amount of slippage or fall back is equal to: (0.852) (3.87) − 2.02 = 1.23 bbl. per cycle, which is 39 per cent of the original fluid column.

Operating efficiency . . . The operating efficiency is simply the ratio of the theoretical to the actual horsepower or the theoretical to the actual injection gas-oil ratio = (10.75 × 100)/12.99 = 82.8 per cent.

It is believed that this analysis will yield a high theoretical horsepower value for the theoretical injection gas-oil ratio, because the theoretical injected gas-oil ratio computed by this method will be higher than actual. Moreover, the total volume between the injection valve and the tubing head will not all be occupied by lift gas.

The beginning of the injection cycle is at a bottom-hole pressure appreciably below maximum buildup pressure. This means that well liquid will be flowing past the injection valve while it is operating and hence, will occupy some of the tubing space that is assumed to be occupied by the injected gas. The net result is a higher calculated efficiency than actually exists.

While the calculated horsepower values are theoretical and not actual, they are excellent correlative parameters for analysis purposes.

Valve-spacing problems in intermittent flow are similar to those of continuous flow. A large-port nonthrottling-type valve should be used as the final operating valve, as this will assure maximum starting velocity. Past experience has shown that use of a ½-in. port intermitting valve has resulted in an average velocity increase in the slug from 750 ft. per minute for a

⅜-in. port to 1,150 ft. per minute for the ½-in. port under comparable producing conditions.

Gas Requirements for an Intermittent Well

A procedure will now be outlined which will allow a theoretical, beforehand estimate of the amount of gas required for intermittent flow. It will be presented by problem example.

Problem . . . It is desired to produce 30°-gravity oil intermittently from a depth of 8,000 ft. Operating casing pressure is 800 psig. and tubing pressure is 100 psig.

Solution . . . Calculate first the theoretical work necessary to lift 1 bbl. of oil. One barrel of 30°-gravity oil weighs 306 lb., so: Work = (8,000) (306) = 2.448×10^6 ft.-lb. per bbl.

Now assuming that the injection gas does all the work in lifting the oil by isothermal expansion, calculate the work in one standard cubic foot when it expands from injection pressure to surface well-head pressure. Pressure in the casing opposite the valve can be calculated or obtained from charts, and it is 955 psia. Tubing well-head pressure is given as 100 psig. or 115 psia. Hence, from the equation for work by isothermal expansion:

$$W = (14.65)\ (1)\ (144)\ [\text{Log}_e\ 955/115]$$

$$= 4.47 \times 10^3 \text{ ft.-lb. per standard cubic foot}$$

To get the theoretical gas-oil ratio at 100 per cent efficiency:

$$\text{G.O.R.} = \frac{(2.448 \times 10^6)\ (\text{ft.-lb.})\ (\text{ft.}^3)}{(\text{bbl.})\ (4.47 \times 10^3)\ (\text{ft.-lb.})}$$

$$= 546 \text{ cu. ft. per bbl.}$$

Now, for over-all efficiency of the intermittent flow operation, it is suggested that the relation set out below is representative:

$$E = 60\%$$

$$\times\ [1 - 5\%\ (\text{depth of well, thou. of ft.})]$$

$$= 0.60\ ([1 - (0.05)\ (8)] = 0.36$$

or 36% over-all efficiency

Therefore, a reasonable approximation of the injection-gas requirement would be:

$$546/0.36 = 1{,}520 \text{ cu. ft. per bbl.}$$

It is well to recall that the same amount of gas will be injected per cycle, regardless of the liquid produced. Therefore, in order to approach the estimated injection gas-oil ratio, attention must be given to valve spread, tubing, and casing combination, and type of chamber installation.

In regard to the chamber installation, two factors should be emphasized. First, the larger the diameter of the chamber, the greater the amount of liquid fillup for a given buildup pressure. More liquid buildup means more oil per cycle for the same amount of injection gas and, hence, a lower producing gas-oil ratio.

The second factor is the most efficient method of removal of a liquid slug. The chamber method is one in which the gas is injected into the chamber on top of the liquid slug, forcing it down and into the tubing or a stinger pipe. The results in maximum fluid starting velocity, before the gas enters the tubing and hence contributes to a much greater efficiency in removing the slug.

The well first described is actually borderline, and will be analyzed for continuous flow in the next installment.

BOOKS

PETROLEUM REVIEW OF GAINES COUNTY, TEXAS. By Robert L. Phifer, Phifer Petroleum Publications, Box 20,024, Houston. 110 pp., $10.

This is the second in a series of reviews of the oil industry in individual counties of Texas. It is an exhaustive study and is replete with structure maps and type logs of the Gaines County fields. Each area is covered in detail from the original discovery up to the present time; items included are location, discovery well, elevation, methods of discovery, producing zones and depths, structural description, deepest tests, proration methods, allowable information, number of producing wells, principal operators, and yearly and cumulative production figures for oil and gas. Production figures for 1954 are broken down by months. An interesting addition to this second volume of this series is a new stratigraphic column prepared by G. Frederick Shepherd, Dallas geologist.

THE OIL AND GAS FIELDS OF WEST TEXAS, Volume 1. Published by Five Star Oil Report, Box 331, Houston. Edited by Arthur Troutman. Price, $25 to subscribers, $35 to nonsubscribers.

This is the first volume of a two-volume set, designed to summarize oil developments in all of West Texas from the first discovery in 1925 to the present time. Volume 1 covers 17 counties, arranged alphabetically, Andrews through Glasscock. The second volume, to be released in December 1954, will cover the remaining counties. The compilation is encyclopedic in nature and answers practically any question on oil and gas exploration, development, and production on some 350 fields. It is profusely illustrated with structure maps, cross-sections, electrical logs, and individual field maps. There is also an individual map of each county with the producing areas outlined thereon. Among the subjects covered under each oil field summary are the following: location, method of discovery, discovery well, structural and reservoir data, producing formations and depths, gravities, proration methods and spacing patterns, market outlets, principal operators, elevations, typical formation sequence, and production record by years with cumulative totals. An interesting addition, not found in previous volumes of this nature, is the inclusion of several summaries of "near-hits" which failed for one reason or another to become commercial fields.

OIL AND PETROLEUM YEARBOOK—1954-1955. Compiled by Walter E. Skinner. Published by W. E. Skinner, 20 Copthall Avenue, London E.C. 2, England. Price: $5 post free abroad.

This 1954-1955 edition of Skinner's standard reference work contains complete organization and financial details of 945 oil companies operating in all parts of the world. All principal American, Canadian, English, and foreign companies are covered by descriptions of their business organization, location of operation, crude oil production, refinery runs, capital structure, and dividends and financial results.

The book contains a Buyers' Guide of Manufacturers of oil field and refinery equipment listed under 875 headings. Names and addresses of 628 managers and engineers of leading oil companies are included.

GUIDEBOOK, FOURTH ANNUAL FIELD CONFERENCE, Alberta Society of Petroleum Geologists, Banff-Golden-Radium, August 1954. 182 pp. Available from Alberta Society of Petroleum Geologists, Box 141, Calgary, Alta., Canada.

The guidebook contains detailed road logs of the Banff-Golden-Radium area as well as several papers on the regional geology. It is perhaps the first attempt at a detailed and comprehensive treatment of the geology of the Southern Canadian Rocky Mountains. Much of this area has not been mapped in its entirety but several of the papers are outstanding. A partial list follows: The Keystone of the Canadian Rockies, Summary of the Geology of the Southern Rocky Mountains of Canada, The Rocky Mountain Trench, as well as several other important contributions to the literature.

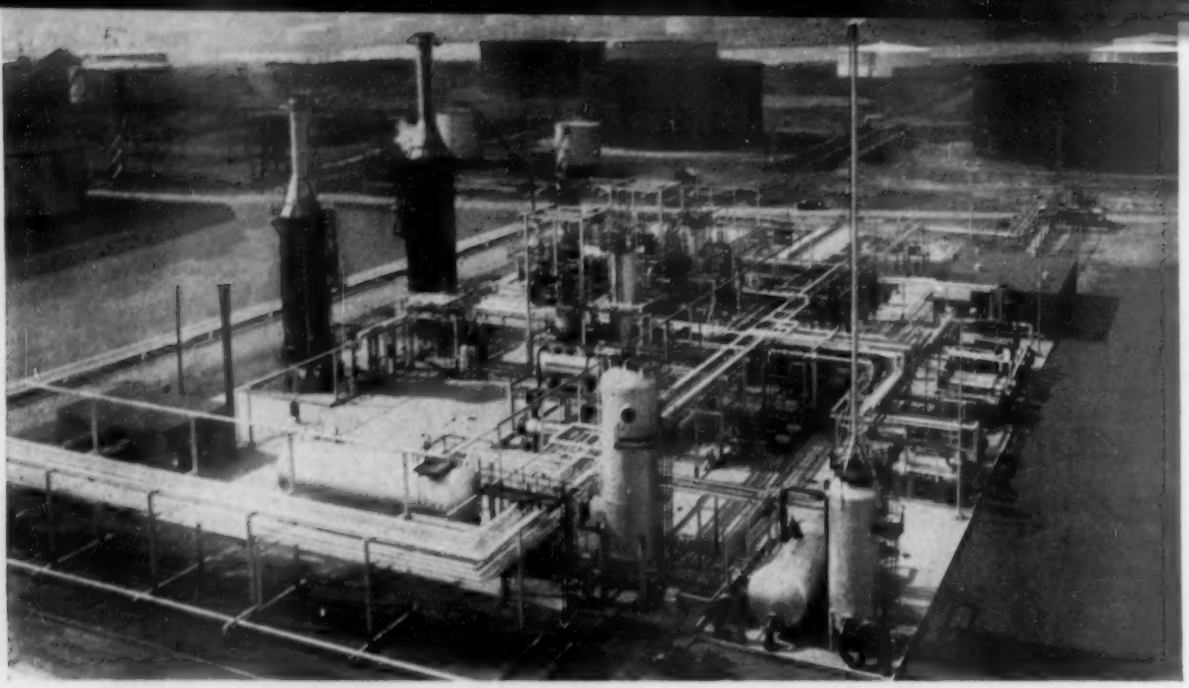
1954 TRISTATE GEOLOGICAL FIELD CONFERENCE, NORTHEASTERN IOWA. Available on request from Geology Department, State University of Iowa, Iowa City, Iowa. 17 pp.

The mimeographed pamphlet covers the route of the field trip taken during the 1954 Tristate Geological Field Conference in northeastern Iowa. It includes a generalized Ordovician and Silurian stratigraphic column as well as notes on the Tertiary and Pleistocene history of the McGregor region. Two measured sections are included, one near McGregor in Clayton County, and the other in Floyd County, Iowa.

MODERN PHYSICS FOR THE ENGINEER. By Louis N. Ridenour. Published by McGraw-Hill Book Co., New York. 400 pp., $7.50.

This volume comprises a collection of lectures delivered to an extension course at the University of California, Los Angeles, during the year 1952-53. It provides the reader who has some degree of technical knowledge with a brief account of some of the more interesting developments in physics.

Part 1, The Laws of Nature, gives physics in its narrow definition—what we know of nature, of orientation, and the laws of their interaction. The second part, Man's Physical Environment, discusses the application of physical laws and techniques of investigation to the study of the universe, of the earth, and of the air. The third section deals with the application of physics to electronics.



Product improvement without loss in yield . . .

Hydrofining—3

Hydrofining of Middle Distillates

by Robert C. Morbeck

WITH the current emphasis upon product-quality improvement in the competitive petroleum market, increased attention is being given to middle-distillate fuels. The Hydrofining process,* as developed by Standard Oil Development Co., offers an excellent means of finishing kerosines, heating oils, and diesel fuels.

Hydrofining is especially attractive when byproduct hydrogen is available from catalytic naphtha reforming operation, viz., fluid hydroforming, platinum catalyst reforming, etc. Catalytic reforming operations have expanded considerably in the last few years. Moreover, Hydrofining is still attractive in many cases even if the hydrogen need be manufactured specifically for the process under consideration.

Finishing middle distillates covers only one phase of the versatile Hydrofining process. A wide variety of petroleum stocks can be markedly upgraded by employing special Hydrofining conditions. The process has been developed from Jersey's wide experience in the hydrogenation field, beginning some 25 to 30 years ago. Hydrofining of lube oils was discussed in a recent article.†

*Hydrofining's Use in Product Improvement, The Oil and Gas Journal, October 18, 1954.

†Hydrofining Improves Low-Cost Lube Quality, The Oil and Gas Journal, November 1, 1954.

Hydrofining as applied to naphthas and gas oils will be the subject of subsequent papers.

Quality improves . . . Hydrofining improves the quality of virgin and cracked middle-distillate fuels in many different respects without loss in product yield. The most important quality improvements are:

1. Color and color stability.
2. Desulfurization.
3. Odor.
4. Burning characteristics.
5. Stability.
6. Blending characteristics.

The use of the Hydrofining process can make excellent finished fuels out of charge stocks that were heretofore considered unsuitable for the purpose.

The process consists of mild catalytic hydrogenation at relatively low-pressure conditions. Hydrogen consumption is required but is low, generally less than 50 standard cubic feet per barrel for treating middle-distillate fuels. No significant change in boiling range occurs and product yields are essentially 100 volume per cent. Generally speaking, the aromatic constituents are not usually affected by the Hydrofining process. To a large degree, the product-quality improvements are gained by converting undesirable components that may be present in only trace quantities.

The process does not require regeneration, and a catalyst life of 6 to 12 months is realized. Following the catalytic treating step, the liquid product need only to be caustic washed or adequately stripped to remove the small

TABLE 1—HYDROFINING KEROSINE

	Mixed sweet crude (338°-545° F.)		West Texas crude (312°-514° F.)	
	Feed	Product	Feed	Product
Gravity, °A.P.I.	41.7	42.0	40.6	41.5
Sulfur	0.10	0.04	0.55	0.02-0.10
Copper number		<1	68	<1
Doctor test		Pass	DNP	Pass
Odor	Fair	Good	Poor	Good
Color, Saybolt	+20	+28	+3	+24
Color hold, Saybolt	+18	+26		+21
Wick char	30	18	65	20
Smoke point	22	22	20	20

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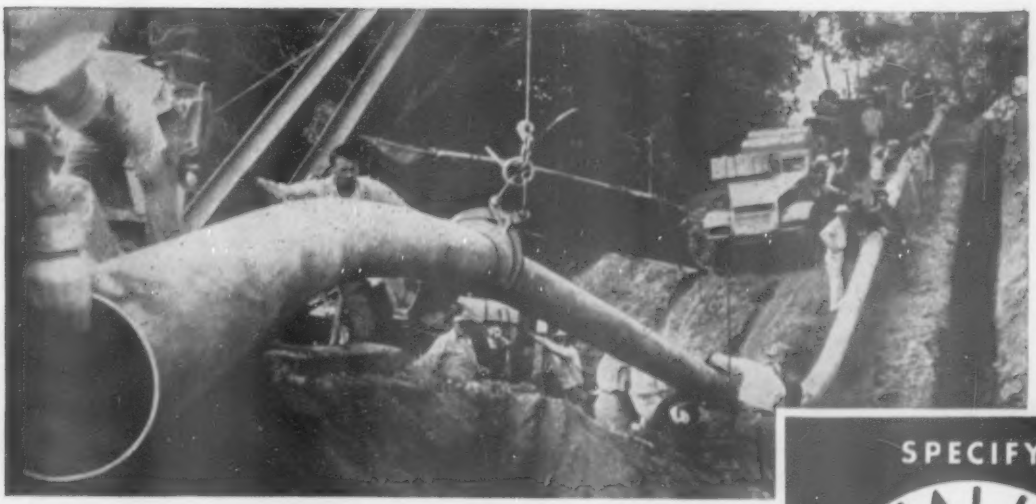

• You'll find thousands of miles of Youngstown Electric Weld Line Pipe in service in rough country. It bends readily in sweeping curves to fit the contours of the most rugged terrain. That's because Youngstown pipe is of highest quality, rigidly controlled throughout manufacture. With Youngstown, you're always assured of satisfactory installations under any conditions.

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amount of H_2S produced in the process.

Kerosines . . . Hydrofining can be employed to refine kerosine from sweet or sour crudes. Of special interest is the improvement in sulfur, odor, color, and wick char. Wick char is a measure of the burning quality of the kerosine. These data are shown in Table 1.

Mild Hydrofining does not improve the smoke point of kerosines since aromatics are essentially unchanged.

Manufacture of kerosine from sour crudes is especially attractive for refinery sites where sweet crudes would not be ordinarily available. Here, desulfurization and sweetening are required as well as other product quality improvements. The Hydrofined kerosines from south crudes have as good product quality as can be obtained from sweet crudes.

Diesel fuels . . . The trend in diesel-fuel quality is toward lower-sulfur fuels. Here again, Hydrofining permits the use of high-sulfur-crude sources to make quality fuels. Typical data for Hydrofining diesel fractions from three high-sulfur crudes are shown in Table 2.

Hydrofining has adequately sweetened and desulfurized these stocks so that they can compete with sweet crude fractions. Cetane number is not improved for the mild operations shown in Table 2.

It is interesting to note in Table 2 that cracked middle-distillate stocks have been upgraded to diesel fuel by the Hydrofining process. Apart from desulfurization, Hydrofining of cracked diesel fuel improves product gravity without any increase in viscosity or pour.

Heating Oils

Prior to blending into commercial heating oil, heavy cracked heating-oil components need to be (1) stabilized, and (2) improved with respect to carbon deposition while burning. Carbon residue on the 10 per cent bottoms from an A.S.T.M. distillation has been employed as a laboratory test to predict the burning characteristics of heating oils. Low values are required for satisfactory burning quality.

Carbon residue . . . Experience has shown that carbon residue is a problem when catalytic heating oils are blended with conversion-sweetened virgin heating oils. Here, marked incompatibility occurs between the two types of stocks. In other words, it is entirely possible to have low carbon residues on both blending stocks and to obtain a markedly higher carbon residue on the final blend. This is due to an interaction between the converted sulfur compounds in the virgin stock and the unstable components of the cracked stock.

Hydrofining not only reduces carbon residue, but also markedly improves carbon - residue - blending characteristics. Typical data for Hydrofining cracked heating oils are shown in Table 3. In this example, since desulfurization was not required, very mild operating conditions were selected to minimize hydrogen consumption.

Hydrofining heavy catalytic heating oils markedly improves both carbon residue and carbon - residue - blending value. The blending value is a method of expressing the effective carbon residue level when blended with the conversion-sweetened virgin heating oil. In addition, the cracked heating oil has been stabilized as indicated by the relatively low carbon residue and sediment formation after storage.

With cracked heating oils from visbreaking and clarified oil cracking operations the major deficiency is one of carbon residue level rather than compatibility. Hydrofining markedly improves carbon residue of thermal heating oil.

Acid treating is an alternate method for improving the quality of heavy cracked heating oils. However, it is difficult to acid treat these stocks in conventional equipment. With the higher end-point stocks it is well nigh impossible due to excessive sludging. Thus, Hydrofining produces commercial heating oil from stocks that would otherwise be blended in low value residual fuels.

Effect on Pool Blends

The proof of any petroleum process is how it affects the final product. Hydrofining heavy catalytic and thermal heating oils is superior to either caustic washing or acid treating, when they are blended into commercial heating oil production. Typical refinery pool blends are shown in Table 4. Here, Hydrofined cracked stocks are blended with conversion-sweetened virgin heating oil and bypassed caustic-washed light catalytic heating oils.

When the cracked stocks are only caustic washed, carbon residue values

TABLE 2—HYDROFINING DIESEL FUELS

	West Texas (308°-641° F.)			Elk Basin (478°-634° F.)		83% virgin Arabian 17% catalytic stock (495°-682° F.)	
	Feed	—Products—		Feed	Product	Feed	Product
Sulfur	0.92	0.15	0.50	1.3	0.25	1.6	0.35
Copper number	92	<1	<1	34	<1	...	<1
Gravity, A.P.I.	37.9	38.4	38.4	31.4	33.5	30	32
Aniline point	143	150	145	154	154	151	154
Diesel index	54	58	56	48	52	45	50
Cetane number	...	53-55	53-55	46	46	51	52
Bromine	...	...	...	...	...	10	1
Color, TR	17	17	18	14	22	...	...
Carbon residue, 10%	0.03	...	0.04	0.02	0.02	0.06	0.02

TABLE 3—HYDROFINING CRACKED HEATING OILS

Source— Boiling range (i.b.p.-f.b.p.)—	Fluid catalytic cracking (494°-652° F.)		Thermal* (300°-664° F.)	
Quality data:	Feed	Product	Feed	Product
Gravity, °A.P.I.	20.5	20.4	34.5	35.1
Sulfur	1.4	1.3	1.6	1.2
Copper number	5	<1	24	<1
Color, TR	16	18	8	13
Color hold, TR	2	10	2	7
Carbon residue, 10 per cent:				
Unblended	0.13	0.03	0.40	0.08
Blended†	0.21	0.04	0.27	0.07
Blending value†	0.37	0.03	0.49	0.08
After storage:				
Carbon residue, 10 per cent	0.45	0.04	...	...
Sediment formation, mg./100 ml.	5.5	0.4	0.3	0.2

*From visbreaking and clarified oil cracking. †Blended in 50 per cent concentration with 650° F.e.p. doctor-sweetened West Texas virgin heating oil having an 0.05 weight per cent carbon residue.

THE AUTHOR

Robert C. Morbeck graduated from University of Wisconsin in 1943 with a degree in chemical engineering. Since that time he has been with the Esso Laboratories where he has been engaged in pilot-plant development of refining processes. Currently, he is a project leader in the process division of Standard Oil Development Co.

Equipped with Bethlehem X2 rods and Bethlehem 114D-14SA automatic pumping unit, this Shell Oil Company well produces 39-40 gravity oil from Woodbine Sand.

Making up the string. The Bethlehem X2 rod is a carbon-manganese rod, and is fully normalized. It is ideal for heavy-pumping duty in non-corrosive wells.

X2 RODS PUMP FIELD WELL IN EAST TEXAS

George Barnes (without hat), of Shell Oil Company, discusses Bethlehem package with Bruce House, Bethlehem Steel Company representative. The Bethlehem unit package saves handling time because it is made up of either 80 or 100 rods, and can be lifted by means of gin-pole truck and lifting rig.

Steady, dependable pumping is being obtained in the J. B. Watson lease No. 37, a 3600-ft well near Kilgore, Texas. The well is operated by the Shell Oil Company, and is pumping from the 2000-ft level. It is producing 20 bpd allowable of 39-40 gravity oil from the Woodbine Sand.

The well is equipped with a Bethlehem 114D-14SA, Series 50 automatic pumping unit. The sucker rod string is made up of Bethlehem X2 carbon-manganese rods, fully normalized.

Operators can always be sure that, for normal well conditions, there are no finer rods than those made by Bethlehem. For Bethlehem rods come in carbon or alloy in five types, each designed for a specific kind of pumping duty. We make a full line of sucker rod accessories, too. If you would like complete information, drop a line to the nearest Bethlehem office or sucker rod distributor.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

BETHLEHEM *Sucker Rods* BETHLEHEM STEEL

are extremely high (0.33 weight per cent). Stability, as judged by sediment formation during storage, is also very poor. A part of these poor quality characteristics is due to the incompatibility problems discussed previously.

Acid treating plus normal rerunning of the cracked heating oils can make reasonably acceptable heating oil blends. However, Hydrofining provides a superior pool blend. The use of the Hydrofining process for cracked heating oils permits elimination of cumbersome acid treating procedures; the rerunning step, the sludge-disposal problems, atmospheric pollution, etc.

Burning characteristics of typical heating oil blends containing Hydrofined catalytic heating oil are very satisfactory. Burning test results were obtained both in rotary burner operation, where carbon deposition is often critical, and in extended gun-type burner tests. Both of these tests are designed to simulate typical commercial practice.

Virgin heating oils . . . Sweetening of virgin heating oils is especially suited to the Hydrofining process. Where sulfur is not a problem, adequate sweetening and odor improvement can be obtained with only enough sulfur reduction to account for the mercaptans present. This minimizes hydrogen consumption. Of course, if sulfur reduction is required, more severe operations can be employed as previously discussed in the diesel-oil section. Typical sweetening results for West Texas virgin heating oils are summarized in Table 5.

In addition to making doctor-pass products, carbon residue is reduced. Here, Hydrofining has a considerable advantage over conversion sweetening (shown in Column C, Table 5) which invariably increases carbon residue. Hydrofining removes mercaptan sulfur as H_2S rather than merely converting the sulfur as conventional processes such as doctor, and air sweetening do.

Basically, removal of the mercaptan sulfur is a sounder procedure for future product-quality considerations than conversion sweetening. In this respect Hydrofining is competitive with the new extractive sweetening processes that are now available.

Because Hydrofining removes mercaptan sulfur as H_2S, Hydrofined virgin heating oils are compatible with caustic-washed cracked heating oils. Thus, Hydrofining either the virgin or cracked component heating oil blends can improve compatibility. Hydrofining both components would give superior product quality and very excellent stability characteristics.

High-Sulfur Cracked Stocks

Low-value heavy high-sulfur crudes can be upgraded by a combination of visbreaking and fluid-coking processes. Middle-distillate fuels from such operations have very high sulfurs and also require treating for stability improvement. Hydrofining can accomplish this sulfur reduction and stability improvement without the large yield losses inherent with competitive processes. Typical data for the cracked heating oils from high-sulfur crude are shown in Table 6.

It is to be noticed that the sulfur content is reduced from 2.2 to 0.4 weight per cent. While improving the odor to a level at which it could be blended with other good heating oil components, marked product-quality improvements are shown for color, phenol number, and neutralization number. As shown at the bottom of Table 6, carbon residue is markedly improved and carbon residue compatibility is satisfactory for the Hydrofined product. Storage tests show the finished stock to have excellent stability.

TABLE 6

Hydrofining Cracked Middle Distillate From a Heavy Sulfur Crude Processed by Visbreaking and Fluid Coking

Boiling range (i.b.p.-f.b.p.)	—350°-660° F.—	
Quality data:	Feed	Product
Gravity, °A.P.I.	26.6	30.7
Bromine number	40	12
Aniline point	98	117
Diesel index	26	36
Sulfur	2.2	0.4
Odor	Poor	Fair
Color, TR	¼	11
Pour point, °F.	<—30	<—30
Phenol number	550	150
Neutralization No.	0.50	0.01
Carbon residue, 10 per cent:		
Unblended	0.37	0.03
Blended	0.17	0.06
After storage	0.63	0.05

Commercial Applications

About 20 commercial Hydrofiners are in operation, under construction, or are in the definite planning stage. Many more applications are being actively considered. In the field of middle distillates, a virgin heating oil plant (20,000 bbl. per day) has been operating for over a year at the Baytown refinery of Humble Oil & Refining Co. Excellent results have been obtained with over 9 months' catalyst life.

Esso Standard Oil Co. has installed a cracked heating oil Hydrofiner (20,000 bbl. per day) at its Bayway refinery. This plant has operated successfully since midsummer. Some six other plants (totaling 65,000 bbl. per day) are planned. Several of these will come on stream in 1955. The above capacity is exclusive of Hydrofining units already installed or under construction for other services.

Economics . . . In most Hydrofining operations mild operating conditions can be utilized to avoid expensive alloys in unit construction. Costs are further reduced since regeneration facilities are generally not needed. For a 10,000-bbl. per day plant approximate investment costs might be $90 to $110 per barrel with average industry standards and contractors fees. Operating costs will be in the range of 10 to 15 cents per barrel. Somewhat higher investments are required if it is necessary to manufacture hydrogen specifically for the Hydrofining process.

TABLE 4—HEATING OIL POOL BLENDS CONTAINING HYDROFINED CONSTITUENTS

(1) 54-57 per cent, 540° F.e.p. lead sulfide-sulfur sweetened West Texas virgin.
(2) 10-13 per cent, 588° F.e.p. caustic washed light catalytic heating oil.
(3) 33 per cent, 653° F.e.p. heavy catalytic and thermal heating oil blend.

Treatment of heavy cracked heating oil—	Caustic washing	Acid treating*	Hydrofining
Pool inspections:			
Gravity, °A.P.I.	32	32	32
Carbon residue (10 per cent), weight per cent	0.33	0.14	0.08
After storage:			
Carbon residue, 10 per cent	0.35	0.20	0.11
Color, TR	6	6	11
Organic sediment, mg./100 ml.	9.0	1.5	1.0

*10 lb., 88 per cent acid.

TABLE 5—HYDROFINING VIRGIN HEATING OILS

Crude source—	Sour crude (West Texas)					
Boiling range (i.b.p.-f.b.p.)—	—330°-530° F.—			—360°-655° F.—		
Column—	A	B	C	D	E	F
	Feed	Prod.	Conversion sweetening*	Feed	Prod.	Prod.
Sulfur	0.67	0.47	0.64	0.92	0.77	0.50
Copper number	91	<1	<1	92	<1	<1
Doctor test	DNP	Pass	Pass	DNP	Pass	Pass
Odor	Poor	Good	Good	Poor	Good	Good
Carbon residue, 10 per cent	0.07	0.01	0.13	0.03	0.02	0.03
Color, TR	24	†20	19	17	21	17

*Lead sulfide-sulfur sweetening. †Saybolt color.

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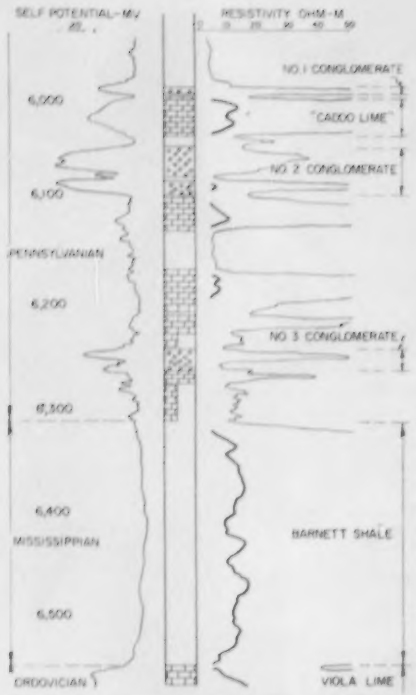
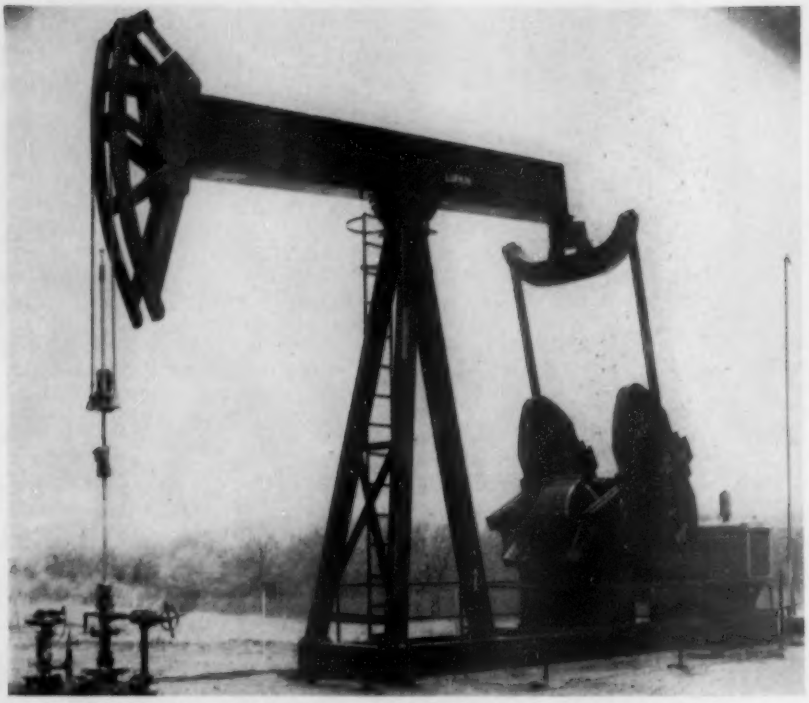


FIG. 1—A composite well log from the Hildreth area. About 150 wells in the field produce from permeable portions of the Bend conglomerate.



As the Hildreth Unit flood has progressed and fluid production increased, some of the wells like this one have required larger pumping units to be insta'led in place of existing smaller units.

Hildreth Unit Sets Pattern for

Secondary Recovery in North Texas

by R. L. Freeborn

THE Hildreth unit operation is still being flooded; but as the first deep reservoir in Montague County, Texas, to be unitized for gas injection and water flooding, it furnishes the operators valuable indications on the floodability of other conglomerate reservoirs in the area.

Cumulative oil production is approximately 6,000,000 bbl. of which about 1,000,000 bbl. is attributed to the water flood. It is estimated that all but approximately 30 bbl. out of the present daily production of more than 1,700 bbl. is secondary oil. Oil production by primary means would have probably come to an economic limit at the end of 1955, but the secondary-recovery operations will extend this many years.

Production records for oil, gas, and water for the Hildreth unit are probably as complete and accurate as can be found for any reservoir in the area. Individual well records of production have been maintained, so that the analysis of the results of the performance of the reservoir under gas injection and water flooding are entirely reliable. The additional oil produced as a result of the water flood is easily discernible for the production curves for each well. The total oil produced to date as a result of the flood is, therefore, determined after considering the performance of the individual wells.

Author is with Continental Oil Co., Wichita Falls, Tex. Paper presented at Secondary-Recovery Symposium of North Texas Oil and Gas Association and North Texas section of A.I.M.E., Wichita Falls, November 18, 1954.

The Hildreth unit is located 9 miles north of Bowie in Montague County, Texas, and is in the southern part of Hildreth field. This field was discovered on February 8, 1943, by Continental Oil Co. 1-A Jack Hildreth. The discovery well was completed at a total depth of 6,109 ft., for an initial potential of 4,504 bbl. of 40.6° A.P.I. gravity oil per day. The potential was based on the flow during the last 3 hours of a 6-hour test period. The gas-oil ratio was 783 cu. ft. per bbl.

Hildreth field was developed on 40-acre units and resulted in approximately 150 oil wells producing from the Bend conglomerate section. The oil accumulations were found in the permeable sections of several conglomerate zones on local highs of a broad northwest-southeast anticline located on the west side of the Fort Worth basin. Fig. 1 is a composite well log from the field.

The Hildreth No. 2 conglomerate zone covers an area of some 2,200 acres and is perhaps the largest single zone accumulation in the field. The largest area of the No. 2 conglomerate section was unitized effective July 1, 1945, with Continental Oil Co. as operator and Sinclair Oil & Gas Co. and Daubes as nonoperators. All zones between the Strawn and the Simpson were unitized. The unitized area contains 53 wells at the present time.

Gas injection . . . Gas injection began in November 1944, into local highs through Hildreth unit Nos. 17 and 47 while unitization details were being worked out. After unitization, gas was

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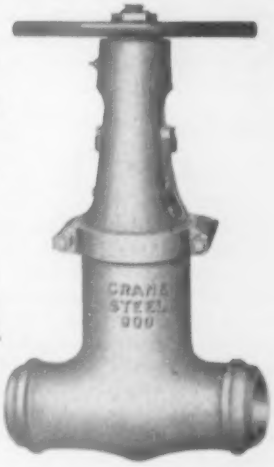

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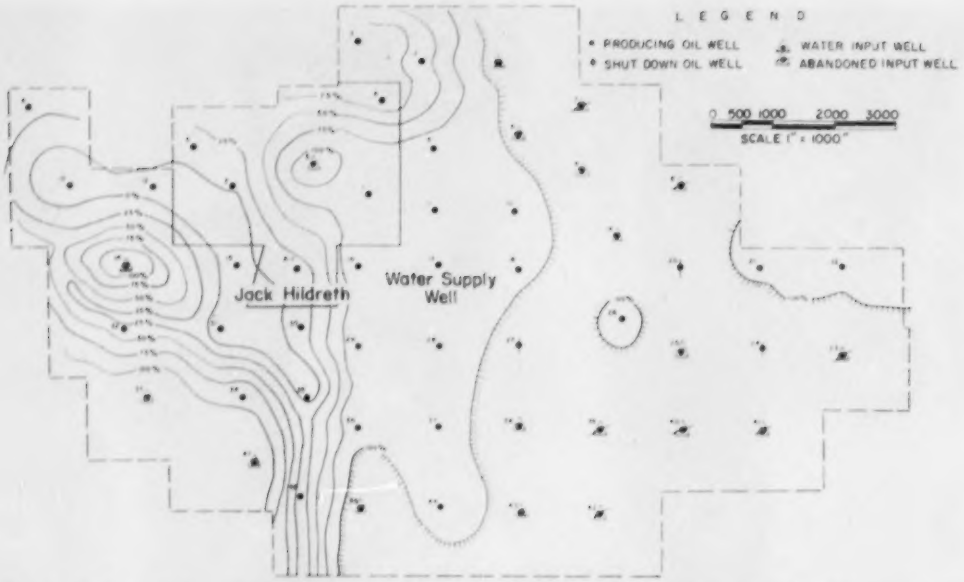

FIG. 2—In order to increase oil-recovery rate, five additional wells were converted to water injection on the west half of the structure.

injected into Hildreth unit No. 11, the highest well on the structure, until June 1950. Gas was also injected through Hildreth unit No. 5 from September 1947 through June 1949. Total gas returned to the reservoir was 3,468,593 M.c.f. Maximum volume injected was during December 1948, when 3,105 M.c.f. per day was returned through the two injection wells.

The gas-injection program resulted in maintaining high oil-production rates and conserving gas. A market for the gas was obtained and gas sales to Highlander Gasoline Co., of Nocona, Tex., began on October 30, 1947. Gas production declined to 300 M.c.f. per day during April 1953, and gas sales were discontinued because there was no production in excess of lease requirements for fuel and gas lift. Total gas sold was 1,934,892 M.c.f.

Water injection . . . Water injection into the No. 2 conglomerate reservoir was commenced during May 1948. The water supply was from fresh-water wells but they failed to yield a sufficient volume; therefore, Hildreth unit No. 17, a gas-input well from November 1944 to June 1946 was plugged back and recompleted in the 4,000-ft. Strawn sand for a salt-water-supply well. Salt water is produced by gas lift through the annulus between 2½-in. tubing and 7-in. casing. Produced water and salt water from Hildreth unit No. 17 are combined and injected into the reservoir at atmospheric pressure.

Fresh water was injected into the flanks of the reservoir through wells No. 8 and No. 41 from May 1948 to March 1950, at which time Hildreth unit No. 17 was recompleted as a salt-water-supply well and the flood was expanded to include wells Nos. 7, 23, and 40. The initial five injection wells had been shut in previous to being converted for injection purposes because they had been flooded out by natural water encroachment, and it was intended to supplement the slight natural water encroachment by water injection.

Additional wells were converted to water injection as the flood front moved westward. Wells east of the new injection wells were shut in as the flood front moved to the west.

It was decided, during the latter part of 1951, to increase the rate of water injection and thereby decrease the life of the flood. Therefore five additional wells on the west half of the structure were converted to water injection service as shown in Fig. 2.

Flood behavior . . . Some producing wells immediately in the path of the advancing flood front had large increases in oil production before water broke through, while other wells benefited only a small amount. The performance of one of the better wells is shown in Fig. 3 by the performance curve of Hildreth unit No. 26. This well was completed during March 1944, and produced a normal allowable of 50 to 60 bbl. of oil per day, until the beginning of 1947 when the gas-oil ratio started increasing rapidly and oil production was restricted. Primary recovery from Hildreth unit No. 26 was 73,637 bbl. of oil.

TABLE 1—RESERVOIR DATA AT ORIGINAL CONDITIONS

Porosity, per cent	14.4
Permeability, md.	257
Connate water, per cent (est.)	30
Bottom-hole temperature, °F.	152
Bottom-hole pressure, psi.	3,000
Saturation pressure, psi.	2,410
Oil formation volume factor	1.493
Solution gas-oil ratio, cu. ft./bbl.	770
Gravity, °A.P.I.	41
Bulk volume, oil zone, acre-ft.	27,305
Area of oil zone, acres	2,180
Average thickness, oil zone, ft.	12.5
Tank oil in place, bbl.	14,302,000
Tank oil in place, bbl./acre	6,561
Tank oil in place, bbl./acre-ft.	524
Solution gas, M.c.f.	11,012,000
Average productivity index, June 1945, bbl./day/lb. press. drop	1.94

The advancing bank of flood oil reached the well during October 1948 and the gas-oil ratio and bottom-hole pressure were insufficient to maintain flowing conditions. During the period from October 1948 to May 1954, 105,895 bbl. of oil was produced from the well and is considered to be secondary-recovery oil. Peak oil production from the well was 131 bbl. per day during July 1950. Water broke into the well in November 1950 and the oil production decreased to approximately 30 bbl. daily while the water production varied from 80 to 125 bbl. daily.

In general, the **better producing wells under primary production were affected more favorably by water flooding than other wells.** Furthermore, Hildreth unit wells Nos. 5 and 11, which served as gas-injection wells, have not produced any appreciable amount of oil as a result of the water flood.

The reservoir apparently was approaching a fillup during the last half of 1953 because increases in oil production were noted. It was necessary

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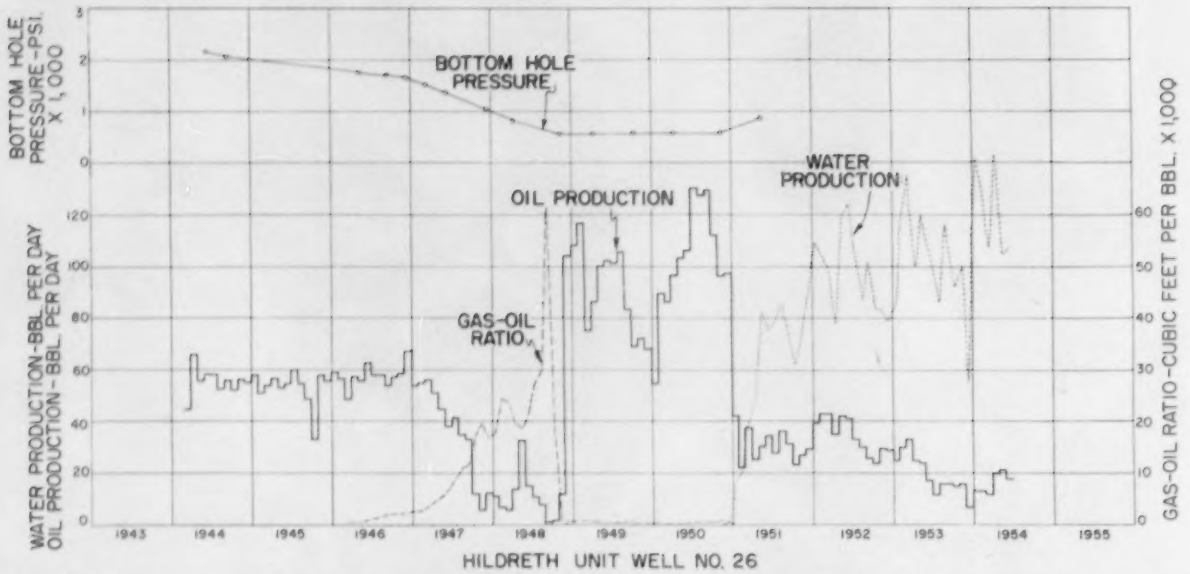


FIG. 3—Performance curve of Hildreth Unit No. 26. It is observed that better producing wells under primary recovery have been better producing wells under secondary recovery.

to install 2½-in. tubing and larger pumps in several wells in order to produce all the oil moving into the well bores. Production curves for the unit are shown in Fig. 4.

Cumulative performance . . . Cumulative water injected into the reservoir to May 1, 1954, was 8,270,442 bbl. Cumulative water production to the same date was 1,171,246 bbl. resulting in a net volume of 7,099,196 bbl. of injected water remaining in reservoir.

Cumulative oil production to May 1, 1954, was 5,903,499 bbl. of which 961,908 bbl. is attributed to water flood. Secondary-recovery oil produced to that date was equivalent to 35.2 bbl. per acre-foot. It is estimated that all but approximately 30 bbl. of the daily production of 1,778 bbl. during April 1954 was secondary oil. Hildreth unit No. 15 is the main producer of the remaining primary oil production.

It is estimated that the oil production by primary means from the Hildreth unit would have been 4,995,500 bbl. to an arbitrary economic limit of 600 bbl. per month at the end of 1955. Thus, the primary recovery is equivalent to 181.5 bbl. per acre-foot, or 2,273 bbl. per acre. This also represents a recovery of 34.6 per cent of the original oil in place. The original oil in place amounted to 14,302,000 bbl. by the bulk volume method.

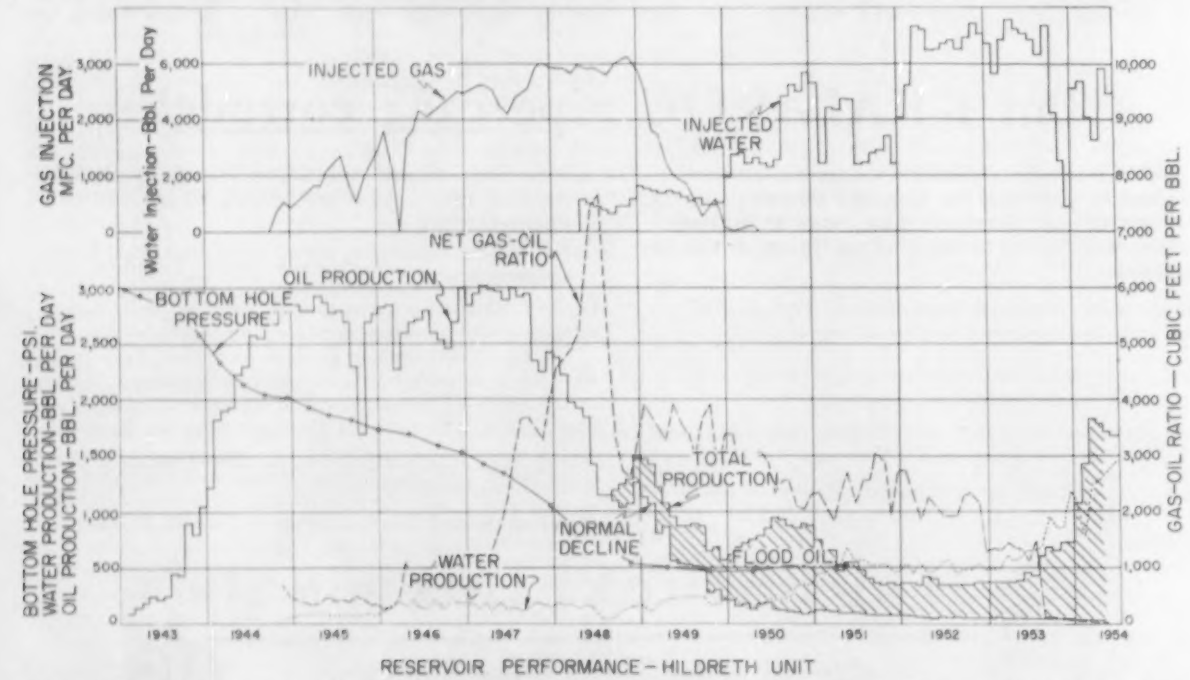


FIG. 4—It is estimated that primary oil production would have come to an economic end in 1955. Secondary recovery has extended that limit for many years.

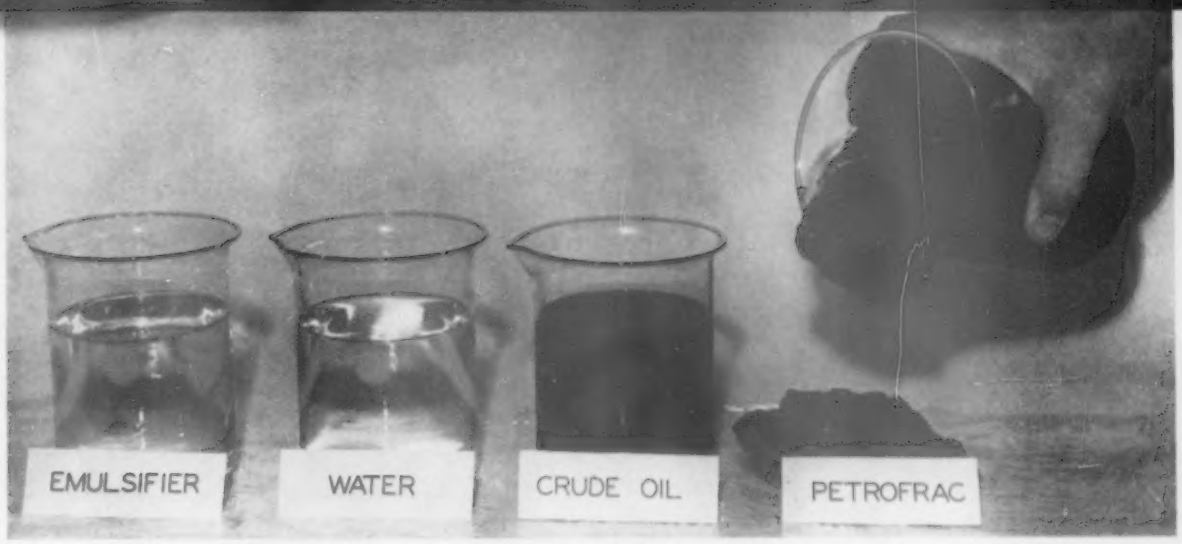


Fig. 1—Petrofrac emulsions can be prepared to any desired thickness from readily available lease crude oil.

New Fracturing Fluid Uses Lease Crude

by R. B. Rosene and Arthur Park

A NEW fracturing fluid has been developed which uses modified lease crude oil, and, thereby, helps reduce the cost to the operator for fracturing a well. The modified crude oil also shows improved sand-supporting characteristics.

Since the advent of hydraulic fracturing for increasing production from oil and gas wells, many fluids have been employed in field treatments. One of the first of these was a thickened kerosine gel. Soon, other fluids were introduced: a thickened solution of hydrochloric acid; an acid-kerosine emulsion; and special refined oils.

The next logical step, both from the cost and supply aspects, was the use of crude oil as a fracturing fluid. Some treatments of this type were performed, but it was found that the sand-suspending properties of most lease oils were very poor, and frequent "screen out" difficulties were experienced.

What is needed . . . Research was directed toward increasing the sand-suspending ability of crude oil, thereby converting it into a suitable fracturing fluid. As such, it was desirable that the modified oil possess certain properties. It must be sufficiently viscous to produce or enlarge fractures, must support sufficient quantities of the propping agent (sand), and must return readily to the well bore, following the treatment.

In the laboratory, several methods of thickening crude oil to increase its sand-suspending ability are known. In one method, a material added to the oil thickens and swells, increasing the viscosity of the oil. This agent is similar in chemical properties and structure to the material used to produce thickened kerosine gel. However, the presence of any water in the oil prevents its thickening.

Analysis of a premium refined fracturing oil indicated that the presence of certain types of sulfonates is at least partially responsible for its sand-suspending ability. It was determined experimentally that the addition of 6 to 10 per cent concentration of petroleum sulfonates to high-gravity crude oils doubles the sand-suspending ability even though only a slight thickening of the oil was noted. However, the sand-suspending ability of this modified crude oil is still insufficient for use in hydraulic fracturing treatments.

New approach . . . The next approach to the problem was the development of an emulsion, composed of the crude oil and a small amount of water. This emulsion was found to have excellent sand-supporting ability, and is unique in several respects. It breaks after entering the formation. No breaker agent is required. Thus the operator need anticipate no reduction in the permeability of the formation due to emulsion blocks, resulting from the fracturing treatment.

The emulsion customarily is composed of 95 to 96 per cent oil, 3.5 to 4 per cent water, and 0.4 to 0.8 per cent emulsifying agent. The quantity of emulsifying agent may be varied to compensate for unusual characteristics of the crude oil being used. Oil, constituting the major phase of the emulsion, is far in excess of the maximum amount (74 per cent) theoretically permissible for a stable emulsion, based on close packing of spheres. Nevertheless, the mixture remains emulsified until it enters the formation. The sand-suspending properties are excellent, and are superior to those of special refined oils or the thick crude oils used for fracturing.

The fracture service utilizing this emulsion is now available and is called Petrofrac.

In the field . . . Any one of a number of emulsifying agents can produce this crude-oil-and-water emulsion. However, only a few are satisfactory when nonhydrocarbon materials are present in the produced oil. The stability of an emulsion depends primarily upon the emulsifying agent selected. In field use, it is expedient to vary the concentration of a standardized emulsifying agent rather than to choose a different agent for each well.

Since some of the physical and chemical properties of the prepared emulsion depend upon the properties of the oil used, many of the emulsion characteristics cannot be predicted with exactness in the field, if the available oil is a problem oil. However, the stability, thickness, and sand-carrying ability of the emulsion usually may be forecast using experience as a guide.

Fluid loss of the fracturing fluid has been of considerable importance in fracturing operations. The fluid-loss characteristics of crude-oil emulsions may be controlled to meet the require-

Authors are with Dowell Incorporated, Tulsa.

Fig. 2—The new crude-oil-and-water emulsion is prepared at the well site in 3,000-gal. paddle mixers, such as that shown in this field scene.

ments of the individual well. Normally, the fluid loss of the final emulsion is nearly identical with that of the crude oil in the emulsion. Materials have been developed, however, that can be added to reduce the fluid loss of the emulsion as desired. Such fluid-loss-control agents break down after introduction into the formation.

Where to use . . . Emulsions prepared from most crude oils will be suitable for use in wells that have a bottom-hole temperature up to 225° F. These emulsions will support as much as 6 to 8 lb. of sand per gallon. In Table 1, properties of other fracturing fluids are compared with those of the new emulsions.

Kerosine has been substituted for the crude oil in Petrofrac emulsions, for the treatment of gas wells. Results have been outstanding. Diesel oil also may be substituted when treating gas wells, or when crude oil is unavailable.

This crude oil-water emulsion has been used successfully in all the major producing areas in the United States and Canada. Because this type of emulsion contains no acid, its greatest application has been to sandstone formations. However, both limestone and sandstone formations have responded favorably to fracturing treatments employing this sand-carrying fluid. Table 2 lists a number of typical case histories of wells that have been fractured using Petrofrac materials.

Preparing the mix . . . Since introduction of the new service, field mixing procedures have undergone numerous changes. The first treatment was performed in Texas; and the emulsion was prepared by adding the crude oil to a mixture of the water and emulsifying agent in a 500-gal. paddle mixer tank while the paddles were rotated at full speed. Mixing was continued for about 10 minutes after all of the oil had been added. Sand was then added and the emulsion pumped into the well.

As this new service was increasingly utilized in the oil fields, rapid mixing of large quantities of emulsion became a necessity. The use of 3,000-gal. paddle mixers, such as that shown in Fig. 2, helped to solve this problem.

A method of continuously mixing the emulsion is now in operation. Essentially, it consists of the following procedure: a premix of emulsion is made in a paddle mixer; oil and the water-agent mixture are then added in the correct ratio from separate lines while, simultaneously, emulsion is being drained from the mixing tank. Proper quantities of sand are added continuously during mixing. In this manner as much as 7 bbl. of emulsion per minute has been prepared.

In another procedure, utilizing a modified standard continuous mixing float-mounted pumper, the oil, water, and agent are pumped into a special mixing unit where shearing and mixing action create the emulsion and sand is added in the proper proportions. The emulsion-and-sand mixture is pumped directly into the well by the same unit.

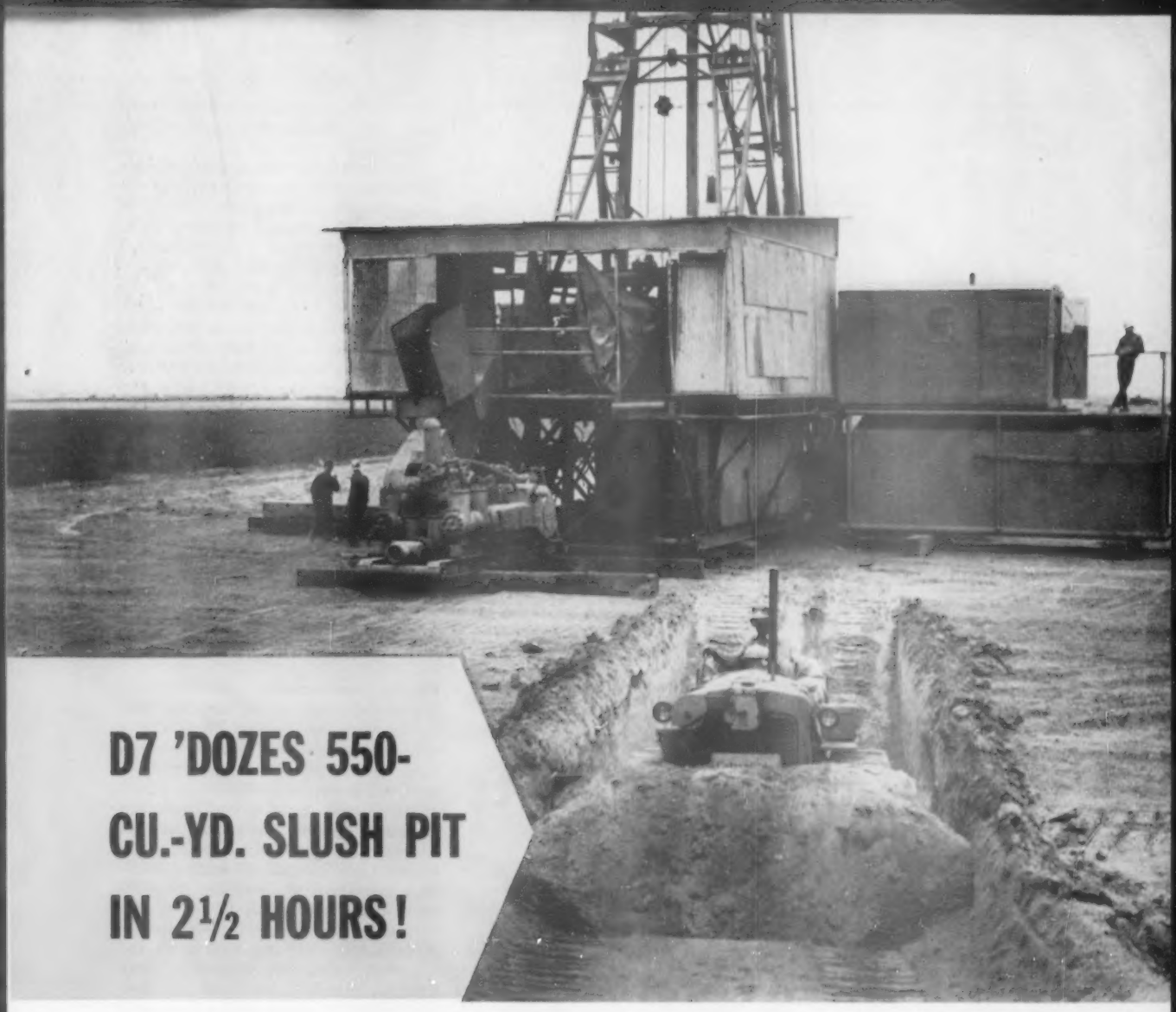
TABLE 1—SAND-SUSPENDING PROPERTIES OF FRACTURING FLUIDS

Fracturing fluid— at 100° F.	Sand-falling rate, ft. per min.	Fluid loss A.P.I. Code 29
Crude oil	12	600 ml./1 min.
Premium refined fracturing oil	3	55 ml./30 min.
Petrofrac	0	600 ml./1 min.
Petrofrac emulsion plus fluid loss control agent	0	80 ml./30 min.

TABLE 2—RESULTS OF FRACTURE TREATMENTS WITH THE NEW CRUDE-OIL-AND WATER EMULSION

State and formation—	Depth	Volume fluid (gal.)	Lb. sand per gallon	Prod. of oil, B. D. Before	Prod. of oil, B. D. After
KENTUCKY:					
Cypress	1,862	1,500	1.0	0	95
ILLINOIS:					
Aux Vases	2,895	3,000	1.5	(‡)	234
Aux Vases	3,211	4,000	2.0	7	67
Aux Vases	3,255	2,000	2.0	25	250
Benoist	2,928	3,000	1.5	1	75
Cypress	2,600	6,000	1.0	3	75
KANSAS:					
Bartlesville	1,093	2,000	1.5	(‡)	48
Bartlesville	2,490	4,000	1.5	1.5	105
Mississippi chat	2,245	3,000	1.3	5	96
Mississippi lime	1,729	5,500	1.0	2	20
Tarkio	2,030	3,000	2.0	4	44
Tarkio	2,388	7,000	2.0	4	120
Simpson	4,280	3,000	1.0	24	188
TEXAS:					
Navarro	5,670	3,000	4	(†)	*177
Navarro	5,420	3,000	4	(†)	*190
Olmos	3,690	5,000	4	(†)	*42
Austin chalk	5,667	3,000	3.3	(‡)	*86
Crockett	3,028	2,000	3.0	(†)	*231
Frio	6,009	3,000	2.5	0	27
Pennsylvanian Strawn	6,700	3,000	4.0	7	112
Spraberry	7,800	10,500	1.5	9	*75
Delaware	4,800	3,000	1.5	12	65
Delaware	4,800	3,000	1.5	10	60
Clearfork	4,000	6,000	1.6	1.5	70
NEW MEXICO:					
Queens sand	2,300	6,000	1.0	24	*341
Queens sand	2,400	6,000	1.5	20	*432

*Flow. †New well. ‡Show.



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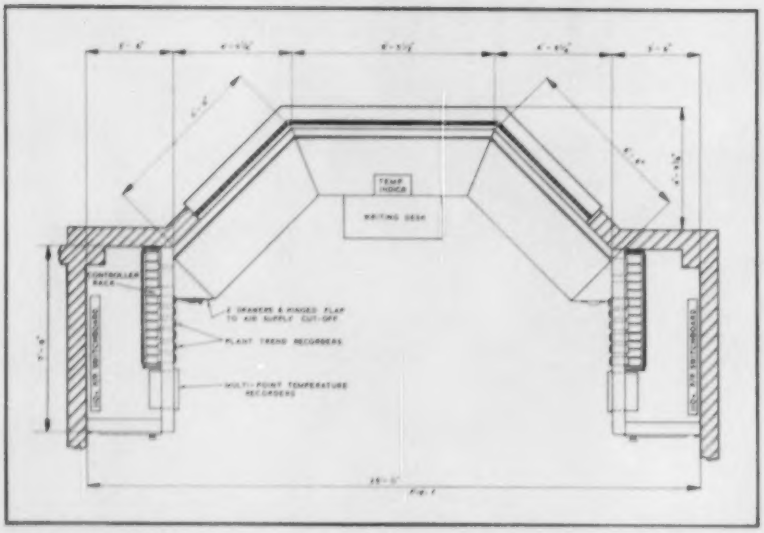


ELECTRONIC CONTROL PANEL is composed of three sections with service cubicle at each end of the panel formation.

Here's how Anglo-Iranian's Aden refinery achieves . . .

All-Electric Control of Crude-Distillation Units

by P. W. Mason

A NEW era of process control began this year with the commissioning of the first of twin all electrically controlled 60,000-bbl. per stream day crude-distillation units at Anglo-Iranian Oil Co.'s Aden refinery.

The control units, designed by E. B. Badger & Sons, Ltd., of London, with the cooperation of Evershed & Vignoles, Ltd., of London, who supplied the electronic instrumentation, are controlled from a central control room of unconventional design.

Author is instrument engineer, E. B. Badger & Sons, Ltd.

Design and Presentation

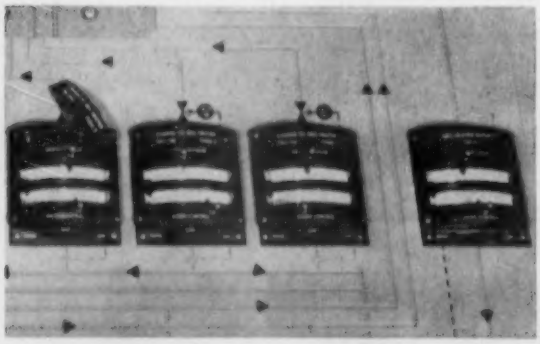
The control room is designed to give the operator the opportunity of viewing the majority of the plant while still performing his control-room duties. The control panel is composed of three sections fitting into the bay window with a service cubicle at each end of the panel formation. Each of the control panel sections is a self-supporting welded structure fabricated from steel angles and is complete with cable trays.

To facilitate maintenance, quick-release panels are fitted throughout the entire length of the panel. The panel face, on which the flow diagram is engraved, is fabricated from ¼-in.-thick medium-hard aluminium sheet. The engraved panel face is angled at 30° to the horizontal to present the most comfortable working position to the operator, the leading edge of the panel being 2 ft. 9 in. above the control-room floor.

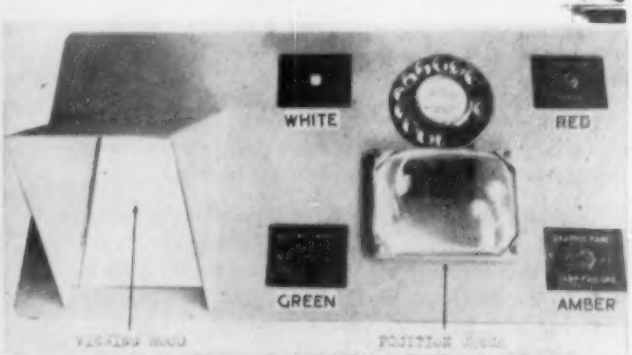
The width of the engraved flow diagram is 2 ft. 4 in. and the topmost edge of the panel is 4 ft. 1 in. above the control-room floor, 2 ft. 4 in. back from the leading edge. Two drawers for the storage of recorder charts are provided at the left-hand end of the panel assembly and beneath them is the emergency trip valve which in an emergency can be used to cut off the instrument air to the control valves which will then take up their fail-safe positions.

Process representation . . . The engraved flow diagram having flow lines ⅛ in. wide and ⅛ in. deep with a minimum of ⅝ in. spacing between lines, shows all the necessary flow, level, temperature, and pressure points in the correct location and functional sequence. Process equipment such as towers, exchangers, drums, pumps, and heaters are fabricated from ¼-in.-thick medium-hard aluminum sheet, affixed to the panel face.

Heater passes and tube side passes of exchangers are engraved upon the respective silhouettes as well as plate levels in towers. Continuous pH sampling points from the primary and secondary distillate receivers are also shown; as are water-injection points upstream of the primary overhead condensers and ammonia injection points for both the primary and secondary towers. Alarm points such as high-low level, high-low pressure, etc., are also



MINIATURE INDICATING CONTROLLER units are placed on the panel board within the flow diagram at or adjacent to the process location.



TEMPERATURE LOGGING is accomplished by using a precision indicator, various selection lamps, and a standard telephone dial with additional index hole.

shown in the flow diagram in their correct location.

Mini-Plaques . . . Miniature indicating controller units 4½ by 3⅜ in. frontal area and edgewise 0-30 ma. indicators having a frontal area of 2¾ by 1½ in. are placed within the flow diagram at or adjacent to the process location. The indicating controller is known as the "Mini-Plaque" and has two indicating scales placed one above the other, each having the same scale length. The upper scale gives the desired and measured values, the lower being used for manual control.

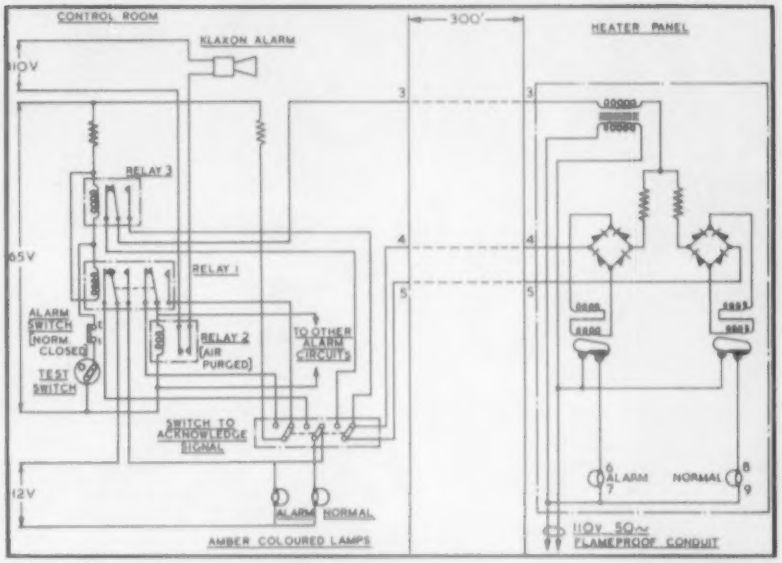
A three-position switch located below the lower scale is used to transfer from automatic to manual; the third position being the "service" position. Control settings are made by removing a plate above the indicator scales and adjusting the proportional derivative and integral settings. Full scale adjustment of the proportional band is 0-600 per cent, derivative time from 0 to 10 minutes and integral time from 0.2 to 60 minutes.

Alarm system . . . The alarm or annunciator system is a specially designed circuit to miniaturize the components to match the miniature indicating controllers and indicators and on the face of the panel shows as two post-office-type amber lamps and a changeover switch. With plant conditions normal both lamps are extinguished and the alarm horn silent. Upon the receipt of an alarm condition both lamps are illuminated and the alarm horn sounds.

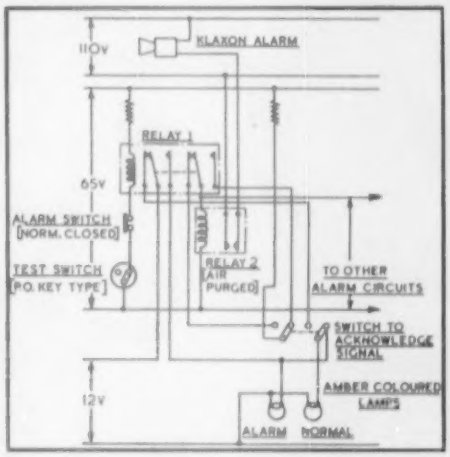
To acknowledge the alarm the control room operator turns the changeover switch from "normal" to "alarm," silencing the horn and extinguishing one of the lamps. This "frees" the annunciator system to accept if need be further alarms on other sections of the plant. The lamp remaining alight serves as a reminder to the control room operator that an alarm condition on that particular section of the plant still exists. When conditions revert to normal and the alarm is lifted, the extinguished lamp relights and the alarm horn sounds.

Returning the changeover switch to its normal position the operator silences the alarm horn and extinguishes both lamps. An extension of this annunciator system has been used to provide a parallel visual alarm to the heater fireman of abnormal conditions on the forced-draft fans of both the primary and secondary heaters. All circuits of the annunciator system including the alarm horn can be simultaneously tested by the operation of a test key switch located in the center section of the control panel.

Six multipoint electronic temperature recorders installed on the sides of the



ALARM SYSTEM (above) is extended to provide a visual alarm to the heater fireman of abnormal conditions on the forced-draft fans of both the primary and secondary heaters.



BASIC ALARM SYSTEM (right) is a specially designed circuit to miniaturize the components to match the miniature indicating controllers and indicators. It shows on the face of the panel as two amber lamps and a changeover switch.

service cubicles, three per side, give continuous records of important plant temperatures which are denoted on the flow diagram by engraved disks located at the correct position and are engraved with the temperature point reference (e.g. TR-2-5). As a point of explanation TR-2-5 really means point No. 5 on the recorder TR-2.

Temperature Logging

Each of these recorded temperatures is also connected to a new thermocouple selection system manufactured by Gilmoor Control Systems, Ltd., of Watford, London. This new system is based upon the use of a uniselector suitably modified and automatically connected to a double-range continuous balance precision indicator. In addition to the temperature points previously referred to, the temperatures of heater flues, heater outlets, reflux lines, and product lines to and from heat exchangers are measured and indicated by the remote selection system.

The precision indicator is mounted below the face of the graphic panel as are the switchboard unit and a power unit. A small control unit is located on the center section of the panel. The telephone dial is of a conventional pattern with an additional index hole midway on the dial. For normal temperture logging the dial is used to select the particular thermocouple point required by using a two-digit system; that is, for thermocouple point No. 8 it is necessary to dial 08.

The two digits are used to select automatically the correct range (iron-constantan or chromel-alumel) on the precision indicator in addition to selecting the correct thermocouple line relay. When both digits have been dialed, the dial returns to its home position and the mechanism performs the following functions:

1. It connects the appropriate thermocouple to the precision temperature indicator.

2. It gives, by means of a cyclome-

5,600,000 new cars in 1955. According to current estimates the automotive industry will build and sell more than five million new passenger cars in 1955. How will your gasolines perform in these new engines throughout the year?

Engineer operates an intricate combination of mechanical, pneumatic, and electronic controls to duplicate road conditions exactly. Here at Ethyl it is possible to create absolutely reproducible tests.

Ethyl Research can help you match your gasoline to the new 1955 cars

What is the best way to be certain that the gasolines you are planning to market this year will give superior antiknock performance in the new 1955 cars—under all driving conditions?

Answer: Look to Ethyl Research.

After twenty-five years' experience in the design, development and improvement of chassis dynamometers for fuel research work, Ethyl Research people have developed three all-weather indoor highways—two at Detroit and the other being constructed at San Bernardino, California. These new test instruments will give you accurate and reproducible knock ratings that have proved far superior to testing on the road.

No traffic impedes the engineers. No sudden shift in the weather upsets the conditions. No shift of crews to other regions for changes in season is needed.

Here in our all-weather rooms, Ethyl research people can control climatic conditions, wind, moisture, temperature and accurately simulate car speeds and road grades. Here experienced crews can work every day of the year, to tell you how your gasoline will behave in the '55 cars on a cold day in Maine, in hot Arizona, in Florida or San Francisco. Every detail of these rooms has been designed to give faster and more accurate evaluation of your gasoline antiknock quality—in any car—under any driving condition.

Here production or experimental fuels can be accurately compared to each other or to standard reference fuels.

These unique all-weather rooms are another example of how Ethyl Research is performing a valuable service to refiners.

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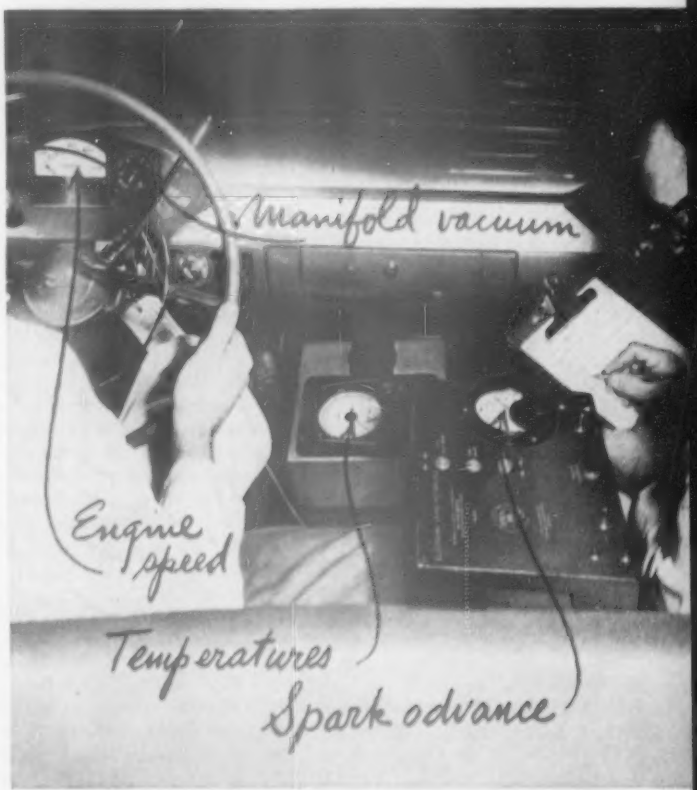
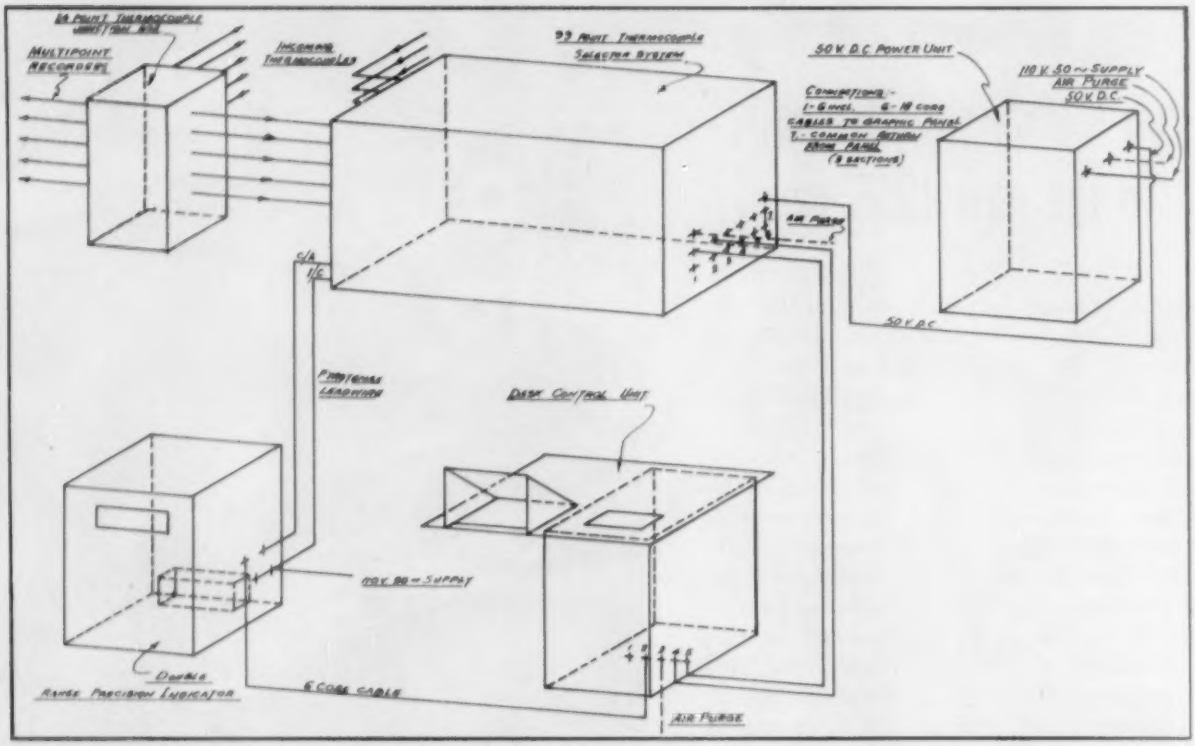
Rear wheels of test car ride on huge rollers that simulate acceleration, hills and other normal driving conditions.



Test engineers check knock and spark advance as car accelerates to "high speed" on one of Ethyl's indoor highways.


MULTIPOINT RECORDERS
INCOMING THERMOCOUPLES
99 POINT THERMOCOUPLE SELECTOR SYSTEM
50 V D.C. POWER UNIT
110 V. 50 ~ SUPPLY AIR PURGE 50 V D.C.
CONNECTIONS - 1 - 6 WIRES, 6 - 18 CORE CABLES TO GRAPHIC PANEL, 1 - COMMON RETURN FROM PANEL (8 SECTIONS)
4M Meter
50 V D.C.
C/A
I/C
PRECISION INDICATOR
DESK CONTROL UNIT
110 V. 50 ~ SUPPLY
Double
RANGE PRECISION INDICATOR
6 CORE CABLE
AIR PURGE

TEMPERATURE LOGGING SYSTEM is shown schematically in this diagram. Selection and clearing systems are set up so that it is possible to select and note a thermocouple reading every 3½ to 4 seconds.

ter-type revolving numerical indicator, a position check to show the number actually selected.

3. By means of illuminating either the "high" or "low" range lamp it indicates to the operator which of the two indicator scales should be read.

4. It illuminates a small indicator lamp located within the graphic panel at a point corresponding to the thermocouple location.

5. It gives warning of graphic panel lamp failure.

6. When selection is complete the extinguishing of the selection period lamp gives clearance for a further selection to be made.

7. The selected thermocouple is held connected to the indicator for an adjustable period of 10-40 seconds duration hold after which the system automatically clears itself. The full-scale travel of the indicator is 15 seconds.

Rapid logging . . . Should the control-room operator wish to log several points in rapid succession it is possible to select and note a thermocouple reading every 3½ to 4 seconds which is the minimum time required for selection and clearance. The actual rate of logging is determined by the temperature interval between the points selected, as it is necessary to wait for the indicator to come to balance before taking the reading.

Use is made of the extra index hole to give immediate clearance of a selection without waiting for the cancellation by the normal duration-hold mechanism. If for any reason the dialing operation should be interrupted and left uncompleted, the system is so arranged to clear itself automatically after 3 seconds.

The switchboard, which is housed below the right-hand section of the graphic panel, houses the relays, fuses, and terminal boards. It is air purged and is mounted astride a service trench which is used to bring the thermocouples to the terminal boards. The terminal boards have capacity of 99 thermocouples, some of which are optional indicating-recording points. In the case of the optional points the normal operating condition is for the temperature to be recorded but at any time the temperature may be measured by the precision indicator without interruption of the record.

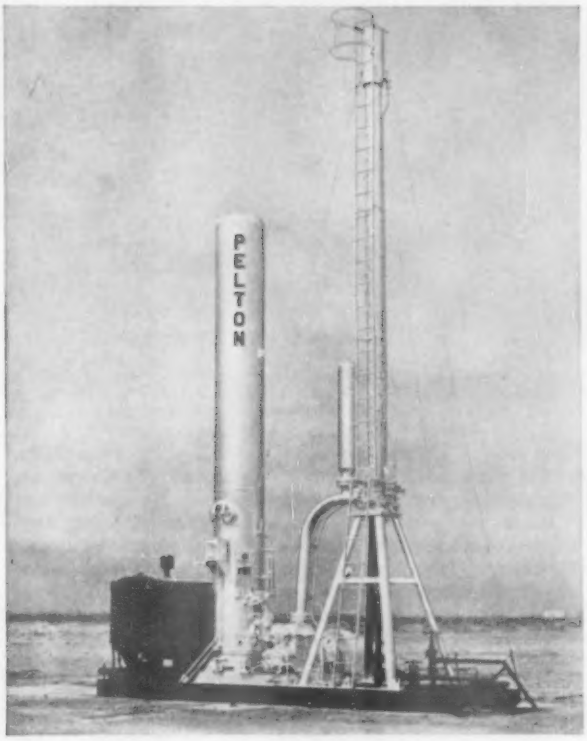
Indicator lamps . . . Six 18-conductor polyvinyl-chloride color-coded cables are used to connect the indicator lamps with the switchboard, the lamps being wired to a common return. The connection between the control unit and the precision indicator is a six-conductor cable; while between the precision indicator and the switchboard there are two compensating leads one of iron-constantan the other of chromel-alumel. Within the switchboard there is an adjustable relay for the duration - hold mechanism and also adjustments for the position-check indicator.

Also built into the switchboard is a standard dropper indicator used as a fuse-failure device which is capable of being hooked into an audible warning system if so desired. An air-purged power unit complete with ± 2½ per cent tappings incorporated in the output stage feeds the switchboard with 50-volt d.c. Each of the switchboard compartments is fitted with an interlock switch.

These switches may be bypassed when the equipment is being serviced, by the manual operation of a master switch housed within the switchboard. This is necessary to enable the maintenance staff to adjust contact loadings under operating conditions, an essential requirement for this type of equipment.

Recording Facilities

The sides of the service cubicles are used to mount 36 single-point "plant trend" recorders, three of which are fitted with selector switches; two are capable of manually switching in five separate signals. The third has a two-position selector switch and is used to record the pH trend of the water draw-off from either the primary distillate



Pelton 20-Foot Stroke Pumping Jack Installed. Unit is skidded into place complete with the desired prime mover. Because of the long stroke, long bottom hole pump barrels with higher efficiency may be used. "Gassy" or sandy fluids handle more easily. Sucker rod stretch losses go down.

Sucker Rods Last Longer. You get long sucker rod life when you team up Pelton long stroke jacks and Monel Polished Rods. The jack, with fewer cycles per minute and a soft hydraulic reversal, reduces peak stresses. Further information on Pelton Jacks may be obtained by writing to The Pelton Water Wheel Company, 2447 East 54 Street, Los Angeles 58, Calif.

When you want good service for pumping equipment

...tie your string to a Monel Polished Rod

Sooner or later, when you reach the pumping stage on a well, you have to think about getting maximum service from pumping equipment . . . and that's when the advantages of Monel® Polished Rods are worth knowing.

Monel Polished Rods have strength comparable to alloy steel . . . and they resist corrosion by salt water, sulfide-bearing crudes and other oil field corrosives. In many holes they've served for years where alloy steel rods showed extensive pitting in days or weeks.

That's why many experienced people in the oil industry prefer Monel Polished Rods. Take customers of The Pelton Water Wheel Company, for example, who buy Pelton Pumping Jacks usually to take care of very severe conditions: deep wells; wells with very high production capacity; wells where sucker rod or pump life is critical. Mr. D. P. Billings, Manager of Pelton's Oil Industry Division, says, "I would estimate that 95 per cent of the long-stroke pumping jacks we sell are equipped with Monel Polished Rods."

He goes on to say, "Our oil field customers are apparently very much aware of the advantages of using Monel and thus usually request the furnishing of a Monel Polished Rod with their pumping unit."

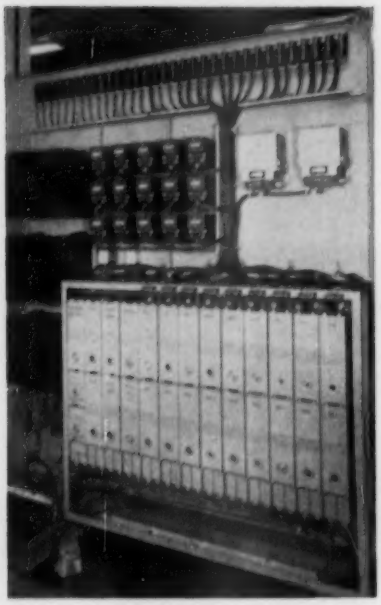
Follow the example of Pelton's customers. Specify Monel Polished Rods and you can be sure of three things:

1. High resistance to corrosion by salt water, sulfide-bearing crudes and other corrosive well fluids.
2. Minimum damage to packing, since Monel rods hold a smooth surface much longer than other materials.
3. High strength, comparable to that of alloy steel.

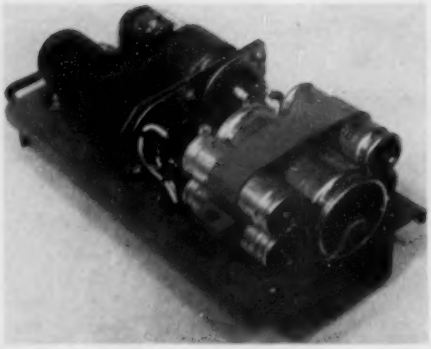
And don't forget that Monel has an equally good record in many other types of oil field equipment. Consider it whenever you want strength plus corrosion resistance.

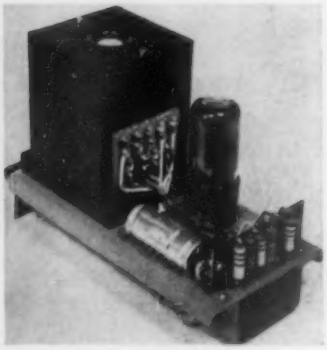
THE INTERNATIONAL NICKEL CO., INC.
67 Wall Street New York 5, N. Y.

INCO Monel . . . *for minimum maintenance*



REAR OF PANEL shows the interchangeable units and electrical connections used for the electronic instrumentation board.





TYPICAL TRAY ASSEMBLIES used for the electronic-instrumentation setup. Trays are interchangeable and a switch can be made in a matter of a few seconds when maintenance is required.

receiver or the secondary distillate receiver as required.

Based on the information furnished by the recorder, the ammonia injections points referred to earlier are manually controlled. The pH recorder differs from the remainder in that it requires only 600-1,300 μ A for a full-scale travel of 6-13 pH, whereas 0-30 ma. is required for the other recorders. These, however, are capable of suppressed range operation when required.

Ten-cyclometer-style electrically operated integrators are installed to give an advancing total of process quantities. They are installed five per side-wing panel; one integrator gives the total crude charge to the unit and eight of the remaining nine give progressive quantities of end products. The remaining integrator is for a possible alternative service on the stabilizer unit.

Gravity measurement . . . The specific gravity of four products, namely, naphtha, benzine, kerosine, and stabilized gasoline is measured after the product has passed through the caustic wash. In addition, the specific gravity of light gas oil and heavy gas oil is measured before leaving the unit on the way to storage facilities. All these measurements are presented on the panel face by means of "suppressed" range edgewise horizontal indicators.

The full-scale span of the indicators covers a change of specific gravity of 0.07, which corresponds to an output of 10 to 20 ma. from the field-mounted transmitter which in itself has an output of 0 to 30 ma. for 0.21 change of specific gravity. The middle third of the indicator scale has a vertical red line at the beginning and end and these serve as a guide to the control-room operator as to the lower and upper limits of "on specification" products, these being the simplest form of quality control on a petroleum-processing plant. At any time the specific gravity of any of the above products may be read to three significant figures.

Plant utility gages for high-pressure steam, low-pressure steam, instrument air, cooling water, and process water are located on the right-hand section of the graphic panel and additionally there are three sets of alarm lights. These lights are paralleled from field-mounted flameproof units and give an indication to the control-room operator of low pressure in the cooling-water system and of high bearing temperature on the crude-charge pumps and the secondary reflux and products pumps.

Controller Arrangement

The electronic controllers are mounted in two banks, one in each wing of the control panel in order to centralize the electronic components and facilitate servicing. Details of this equipment have already been described and published.[1] Each bank is 4 ft. long by 1 ft. 5 in. deep by 2 ft. 9 in. high, bolted to the floor inside the service cubicle as well as to the rear of the service cubicle panel.

In the two banks there are a total of 55 measuring trays, 5 proportional trays, 31 three-term trays, 2 trays for hand-control supply units, 2 complete spare controller trays (measuring and three-term), 5 spare measuring trays, 6 temperature transmitter power units, and 1 alarm-system power unit.

The top of each rack is fitted with terminal blocks all of which are clearly tagged with the instrument number, and all the six-conductor polyvinyl-chloride cables from the instruments on the panel are brought to one side of the terminal block and the cables from the control and measuring trays to the other side, both sets of cables being to a common color code.

The connection of the trays to the wiring system is by means of a 12-contact plug and socket, and a micro-switch is wired in series with the power supply and so adjusted as to break the supply before plug and socket separate. In addition a neon stabilizer tube on each measuring tray gives visual indication of whether the power is on.

The tray assemblies are housed in separate compartments, which are capable of accommodating one measuring tray and three-term tray or three measuring trays. These compartments are sealed and purged with air.

"You got an interest in this wildcat, Bub?"

Acknowledgement

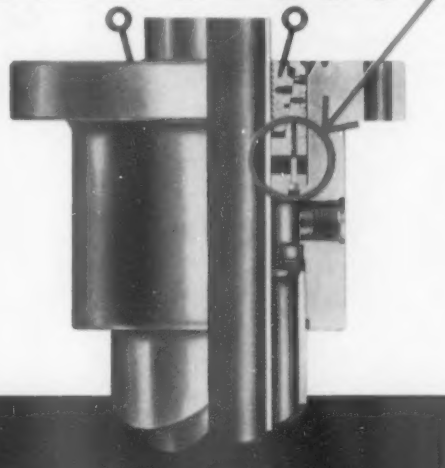
The author wishes to thank the directors of Anglo-Iranian Oil Co., Ltd.; E. B. Badger & Sons, Ltd.; Evershed & Vignoles, Ltd.; and Gilmoor Control Systems, Ltd., for their kind permission to publish this article.

Reference

1. Marchment, W. T., Electronic Control in Petroleum Processing, The Oil and Gas Journal, November 9, 1954, p. 124.

It's human nature to forget sometimes...

but this O-C-T AUTOMATIC SEAL *Can't Forget*



Regardless of how or when you decide to install the O-C-T "C-20" Casing Hanger . . . before cementing, after cementing, through preventers, under preventers, or at any time in case of stuck pipe . . . you can improve the safety of your completion operations and save hours of expensive rig time due to the flexible, simplified O-C-T installation procedure.

The first quick-setting, positive-sealing well head designed especially to eliminate open hole hazards in medium depth wells, the O-C-T "C-20" Casing Hanger can't forget to seal . . . because the sealing element, slip bowl and slips are assembled as a single unit that may be wrapped quickly around the casing, latched and dropped into place, eliminating the possibility of individual parts being installed incorrectly. Check these other features: it seals and suspends automatically; it employs a resilient seal ring which provides an effective seal for the life of the well in any climate.

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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Value of World Competitive Crude Oils

"In your answer of October 11, 1954, you showed the quality of the gasoline, diesel fuel, etc., of various crude oils but you did not arrive at the real value of crude oils. They seem to be nearly equal but what is their value?"—A.G.P.

The well-head value of the major world competitive crude oils is nearly the same if each of the oils is processed in such a way as to meet the market demands in its vicinity. Thus, although East Texas crude oil can easily produce 10-15 per cent of lubricating oil by solvent-extraction processes, the main bulk of the crude oil must be processed for gasoline by cracking and the average amount of lubricants produced from the oil would probably not exceed the 3.4 per cent shown in Table 1.

Yields and operating costs are indicated in Table 1. The methods of selecting yields and determining operating costs are ones long used by the author and they may be considered as standard methods for the determination of yields and crude-oil values. The methods have been applied to hundreds of crude oils. Space does not permit a detailed explanation of the details of the methods. Although many products not shown among the yields, such as kerosine, can be produced from any of the crude oils, the cost of manufacture is very much larger if inferior crude oils are used for kerosine manufacture with little or no profit deriving by the manufacture of kerosine. Accordingly, the standard yields are based on the production of the most valuable products that can be made cheaply and easily from crude oil. However, the maximum amount of valuable lubricating oils and waxes are not produced because the market can accept only a limited amount of such products.

Much argument can arise regarding proper operating costs and accordingly a standard method of estimating such costs was developed. The use of the standard method insures at least, that the operating costs will be comparable with one another.

TABLE 1—VALUES OF A FEW WORLD COMPETITIVE CRUDE OILS AT THE GULF COAST FOR YEAR 1952

Crude oil—	Average Venezuela	Average California	Average Mississippi	Typical coastal	Average Middle East	Average West Texas	Average East Texas
A.P.I. gravity	25	25	26	31	36	37	38
	*25.3	*26.2	*29.8	*31.5	*35.8	*37.2	
Per cent sulfur	1.39	0.98	1.62	0.14	1.42	0.45	0.26
Characterization factor:							
At 250	11.89	11.75	11.85	11.7	12.12	12.04	11.9
At 550	11.57	11.54	11.70	11.35	11.85	11.85	11.85
At 750	11.67	11.60	11.70	11.72	11.81	11.96	12.05
Oct. No. (motor) of S.R. gasoline	55	61	48	62.5	40	49	56
Cracking stock, per cent	19	33.4	42	32.5	27	33.5	25.9
Yields, volume per cent:							
Gasoline, S.R. to 400° F.	14.3	20.0	11.9	28.0	29.4	30.9	32.0
Gasoline, cracked	10.7	20.0	25.2	19.5	15.9	20.1	15.9
Gasoline total	25.0	40.0	37.1	47.5	45.3	51.0	47.9
Loss	2.1	3.0	3.5	3.0	2.6	3.0	2.6
Kerosine (375°-500° F.)							13.3
Diesel fuel (400°-700° F.)	34.8				10.8		
No. 2 distillate (remnant to 550° F.)		14.4	15.0	33.0	11.1	15.1	4.7
No. 3 distillate†	3.3	5.8	7.3	5.7	4.7	5.9	4.5
Lube by solvent extraction							3.4
Bunker C fuel	34.8	36.8	37.1	10.8	25.5	25.5	23.6
Product realization, average Gulf Coast 1952)	$3.09	$3.18	$3.11	$3.70	$3.46	$3.51	$3.59
Operating costs (Gulf Coast 1952):							
Basic investment	4.1	4.1	4.1	4.1	4.1	4.1	4.1
General labor	10.9	10.6	10.7	15.0	12.7	12.6	12.8
Costs due to sulfur	8.0	5.3	9.0		8.0	3.5	
Costs due to sourness					2.5	3.5	
Fuel, power, and water	9.6	9.3	9.4	13.1	11.0	11.0	11.2
Cracking and related operations	7.1	12.5	15.7	12.1	10.1	12.5	9.7
Upgrading gasoline	4.6	5.0	6.8	3.6	15.7	16.1	9.1
Miscellaneous	2.2	2.3	2.8	2.4	3.2	3.2	2.3
Profit	6.3	6.4	6.3	7.5	7.0	7.1	7.3
Total, cents per barrel	52.8	55.5	64.8	57.8	74.3	73.6	56.5
Value of crude oil (ledivered at refinery)	$2.56	$2.62	$2.46	$3.12	$2.72	$2.77	$3.02
Value—30° A.P.I. crude oil (using 2-cent differential)	2.66	2.72	2.54	3.10	2.60	2.63	2.86
Value—30° A.P.I. crude oil (using 3-cent differential)‡	2.71	2.77	2.58	3.09	2.54	2.56	2.78

*1951 average production. The nearest gravity average analysis was used. †17½ per cent of the cracking stock. Half of the cracking was conducted catalytically at a conversion of 65 per cent. ‡A 3-cent difference in price per °A.P.I. most nearly represents the true differences in value.

Each of the cost items is related in some way to the properties of the crude oils such as the amount of (1) sulfur or sourness, (2) overhead product, (3) cracking and related processes required, (4) upgrading of gasoline with TEL or by reforming, etc., and the total cost is close to the average for the entire United States. Prices are f.o.b. refinery except in the case of lubricating oils where a net product value (market price less cost of manufacturing lubricants—$4.65 per barrel herein for solvent refined oils) is used. This, of course, includes a hidden operating cost which in the case of East Texas crude oil (Table 1) may add 16 cents to the operating cost making a total operating cost of about 57 + 16 = 73 cents per barrel. Prices are average Gulf Coast cargoes for the year 1952, which was the last somewhat normal year for the industry.

The values of various world competitive crude oils at the Gulf Coast during 1952 were about:

	30° A.P.I. oils*	Oils of average gravity
Typical coastal	$3.09	$3.12
East Texas†	2.78	3.02
Average California	2.77	2.62
Average Venezuela	2.71	2.56
Average Mississippi	2.58	2.46
Average West Texas	2.56	2.77
Average Middle East	2.54	2.72

*Corrected to 30° A.P.I. by a 3-cent differential per °A.P.I. †About 7 cents per barrel less if lubricating oil is not produced, and it is worth very much more if processed completely for lubricating oils and wax.

Yields by Platinum Catalyst Reforming

"What are the yields of reformed naphtha by the catalytic reforming process?"—R. A. N.

The now highly successful platinum catalyst reforming processes operate differently during every stage of degradation of the catalyst. However, the yields in pilot-plant runs as outlined by The Oil and Gas Journal, July 20, 1953, p. 64, and by Haensel and Donaldson, Pet. Processing, Feb. 1953, p. 236, are indicated in Fig. 1. Each stock should be processed at somewhat different operating conditions and in establishing Fig. 1, the yields for the best operating conditions of each stock were used.

According to Fig. 1, the lower characterization factor (or octane number) charge stocks yield larger amounts of debutanized reformate. About 15 per cent (12-17) of butane can be added to the debutanized reformate in making a 10-psi. R.v.p. product. This results in some cases in a finished yield of even 107 per cent based on the original feed stock. The following tabulation indicates approximate yields from various types of charge stocks of 90 research octane number reformate:

Characterization factor	Approximate percentage: Pentane plus	10 R.v.p.	Illustration of charge stock
11.6	90.7	104.3	Coastal
11.7	89.1	102.5	Venezuela
11.8	87.7	101.0	Texas
11.9	86.4	99.4	Mid-Continent
12.0	85.0	97.7	Pennsylvania
12.1	83.3	95.8	Middle East

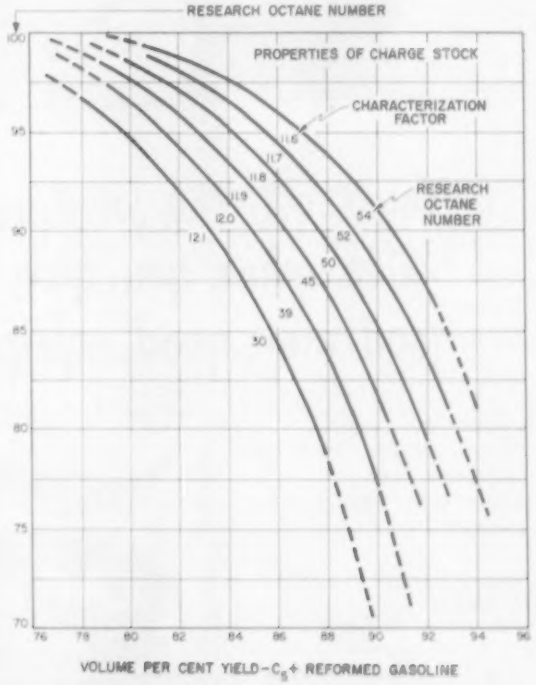


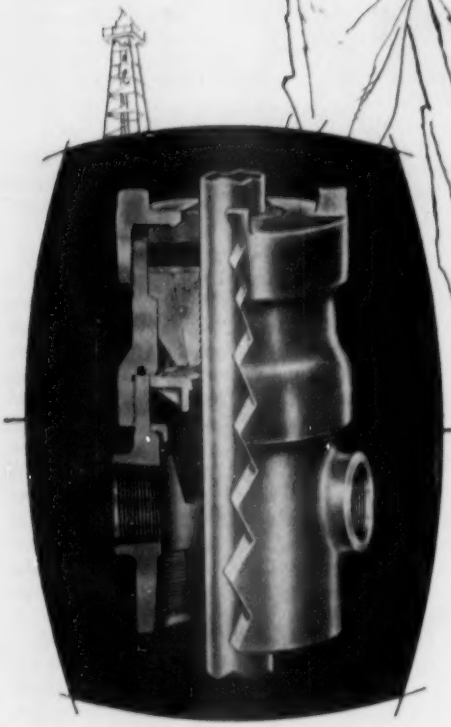
FIG. 1—Approximate yields and octane numbers of catalytically (platinum) reformed naphthas when processing 200°-400° F. charge stocks.

Rules for Estimating Asphalt in Crude Oil

"Are there rules or approximations by which the asphalt content of a crude oil can be estimated?" S. C. F.

The asphalt part of a crude oil boils at such high temperatures that not many data are available. Most generally, the residues that boil above temperatures of 900° F. have a penetration that lies in the ranges called for by asphalt specifications. With very heavy or asphaltic crude oils (13° A.P.I.) the asphalt portion (100 penetration at 77° F.) starts at about 850° F., whereas with light crude oils (36° A.P.I.) the asphalt portion must boil above about 975° F. *(Asphalt by Vacuum Distillation, Questions on Technology, February 1, 1951, p. 76).* Somewhat the same is indicated on this page of April 21, 1952, p. 171, with regard to Asphalts from Eastern Venezuelan Crude Oils.

However, boiling range is not a convenient method because data are usually lacking. Accordingly, Stanfield and Hubbard (Asphalts from Rocky Mountain Crude Oils, Bureau of Mines Tech. Paper 717, 1949) suggest that the content of 100-penetration asphalt can be estimated for comparative purposes by multiplying the carbon residue of the crude oil by 4.9. The numerous Hempel analyses of the Bureau of Mines show carbon residue, and hence an estimate of asphalt content can be made for almost any common crude oil.



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Unsteady-State Flow in Gas Reservoirs—6

Formation Permeability From Well Tests

by Dr. R. F. Nielsen

BEFORE performance tests on gas wells, the well is shut in long enough for pressure to be essentially uniform over the area drained during test. The well is then produced at a constant rate. It may be produced at other rates, with or without an intervening shut-in period. During the first period, bottom-hole pressure will continually drop while drainage radius increases.

Cornell's method[1] estimates permeabilities from rate of bottom-hole-pressure decline. If pressure distribution in the drainage radius is "steady state," then p^2 varies linearly with ln r, r being distance from well center. Quantitatively:

$$\frac{d\,p^2}{d\ln r} = \frac{p_e^2 - p_w^2}{\ln (r_e/r_w)} \qquad (1)$$

where e refers to drainage radius and w to the well. From the radial-flow formula:

$$q = \frac{520\,\pi\,Kh\,(p_e^2 - p_w^2)}{14.7\,\mu \ln (r_e/r_w)\,ZT} \qquad (2)$$

where q is in s.c.f. per day, K in perms, p in psia., μ in cp., h and r in ft., and T in °R. Combining constants and substituting in Equation 1:

$$\frac{d\,p^2}{d\ln r} = \frac{0.009\,q\,\mu\,ZT}{Kh} \qquad (3)$$

For correlation purposes it is best to use a relative or "reduced" pressure $P = p/p_e$:

$$\frac{d\,P^2}{d\ln r} = m = \frac{0.009\,q\,\mu\,ZT}{Kh\,p_e^2} \qquad (4)$$

With an expanding drainage area, bottom-hole pressure decreases with time. In Cornell's graphs, P^2 varies linearly with the logarithm of time when m (and hence q) is constant. This relation is apparent from the figure of No. 3 of this series[2] where F is proportional to time and is the fractional depletion of a reservoir with radius 200 times well radius. Therefore:

$$F = \frac{14.7\,qt\,ZT}{520\,p_e\,fh\pi\,(200\,r_w)^2} = \frac{0.225 \times 10^{-6}\,qt\,ZT}{p_e\,fh\,r_w^2} \qquad (5)$$

Fig. 1 is a replot of that figure showing P^2 as a function of F for several reduced rates m. As an approximation, they may be regarded as straight lines with slope proportional to m. With two bottom-hole pressure values, one at time t and one at time 2t, then:

$$P_w^2(t) - P_w^2(2t) = 0.35\,m \qquad (6)$$

Substituting in Equation 4, transposing, and recalling $P = p/p_e$:

$$K\,(\text{perms}) = \frac{0.00315\,q\mu\,ZT}{h\,[p_w^2(t) - p_w^2(2t)]} \qquad (7)$$

For any other time ratio n, 0.0105 log n must be substituted for 0.00315.

If flow is controlled only by a choke or a critical flow prover, it will decrease during the test in proportion to upstream pressure on the prover. An approximate adjustment[4] may be made on bottom-hole pressure at t_1 to make it correspond to the flow at t_2. Since $p_e^2 - p_w^2$ is proportional to flow:

$$p_{w1}^2\,(\text{cor}) = p_e^2 - (p_e^2 - p_{w1}^2)\,q_2/q_1 \qquad (8)$$

Well radius does not appear in Equation 7. Since it is based primarily on rate of expansion of drainage radius, such things as damage or turbulence near the well should not greatly affect calculated value of K (or Kh). Of course, primary assumptions, such as homogeneity, must be kept in mind.

Pressure build-up rate following shut in might be used to determine permeability. Equations usually employed in build-up curve analysis were derived for a liquid by the method of superposition. This method is strictly valid only when volume is a linear function of pressure. Volume of a perfect gas is a hyperbolic function of pressure; but, if pressure variations are small compared to average pressure, then volume is approximately a linear function of pressure. When $1 - P$ is small it may be represented by:

$$1 - P = m\,(4 + 0.6 \log F) = 0.6\,m\,(\log t + \text{const}) \qquad (9)$$

If well is flowed for t_1 days and shut in for t_2 days, then superposition gives, substituting for m and P:

$$p_e - p_w = \frac{0.0054\,q\mu\,ZT}{Kh\,p_e} \log \frac{t_1 + t_2}{t_2} \qquad (10)$$

Hence slope (change in p_w per cycle) of a semilog plot of p_w against $(t_1 + t_2)/t_2$ should be the coefficient in Equation 10. Difficulties due to compression in tubing and casing may make this method less desirable than the one first described.

Author is associate professor of petroleum and natural-gas engineering, Pennsylvania State University.

References

1. Cornell, World Oil, Vol. 136, No. 2, p. 186, February 1953.
2. Nielsen, The Oil and Gas Journal, December 6, 1954.
3. Bruce, Peaceman, Rachford, and Rice, Trans. A.I.M.E., Vol. 98, p. 79, 1953.
4. Cornell, World Oil, Vol. 136, No. 1, p. 180, January 1953.

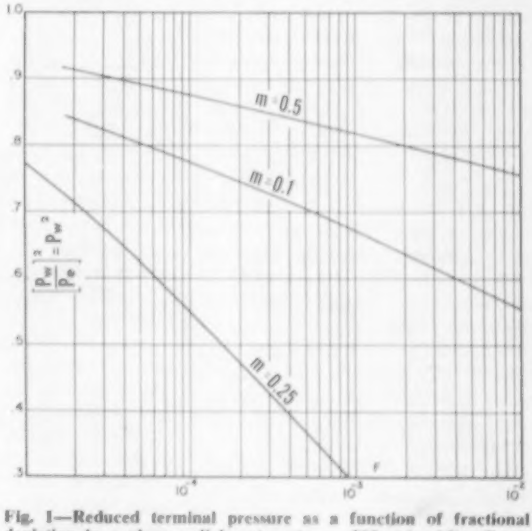

Fig. 1—Reduced terminal pressure as a function of fractional depletion in a plane radial system ($r_e = 200\,r_w$). After Bruce et al.

ELECTRIC LOGGING—47

The Background of Radioactivity Logging

by R. I. Martin

ATTENTION was first directed to radioactivity logging because it was hoped that a direct relationship would be found to exist between radioactivity and petroleum. Such a relationship has not been found, but nevertheless radioactivity logging has proved to be a useful tool for subsurface work.

Radioactivity logging was offered on a commercial basis in 1941. Unlike electric logging, it may be carried out in cased holes. The logging of wells completed before electric logging was available, afforded a large field for radioactivity logging. Other applications are the logging of wells drilled using special muds, in which satisfactory conventional logs cannot be obtained.

At the present time, several service companies offer radioactivity logging as a result of developments during the past few years. As an introduction to the subject, it will be useful to review some of the fundamental theory.

Radioactivity . . . Atoms may be thought of as extremely minute solar systems involving three basic quantities—protons, neutrons, and electrons. Protons are particles carrying positive electric charges, neutrons carry no charge, while electrons carry a negative electric charge.

The "central sun" of an atom is known as the nucleus. It is made up of one or more protons and one or more neutrons. Moving in orbits around the nucleus, at various distances from it are the planets, the electrons. There is one electron for each proton in a neutral atom. The number of neutrons in an atom varies from none in the hydrogen atom to many in the case of the heavier elements. Although electrons rotate rapidly around the nucleus, they do not escape because of the mutual attraction.

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

Radioactive properties are essentially properties of the nucleus of the atom. In contrast, most of the superfically observable characteristics of a substance depend on the number of electrons outside the nuclei of the atoms of which the substance consists. For example, radium E is exactly like bismuth in all its chemical properties because such properties depend on the electrons outside the nucleus. In other respects, however, radium E is quite different from ordinary bismuth.

If there is a large number of atoms of radium E, occasional events will take place. A very fast little projectile will leave the nucleus of one of the atoms. It will be one electron moving with almost the speed of light. This electron is known as a beta particle.

The occurrence of such a drastic event causes changes within the atom from which the electron has issued. In the case of radium E the atom becomes altered to the extent that it now resembles polonium. The polonium itself is also radioactive, and sooner or later will expel from its nucleus another projectile. This particle consists of a nucleus of helium, and is known as an alpha particle.

After the helium nucleus has been emitted, the polonium undergoes change, and becomes atoms of lead. Lead is a stable element and is the end product of many such similar series of changes.

Radioactivity, therefore, is characterized by an instability of the atoms of which a radioactive substance consists. The escaping of particles from the nuclei of a radioactive substance is a chance process. It has no relation to the past history of any particular atom. All that can be said is that on the average, a certain percentage of the atoms will explode during a unit of time. The exact number which explode during any one second will vary somewhat because these disintegrations are a chance process. The number will fluctuate above and below the average number which would be obtained if the measurements were repeated a large number of times. These fluctuations can be minimized if undue speed in logging is not insisted on.

Because radioactive elements tend to disappear by transmuting themselves into other elements, the amount of radioactive elements present is constantly decreasing. Only those which disappear relatively slowly have been able to remain in any quantity up to the present time. These are found to be the uranium series, the thorium series, and potassium.

Gamma rays too . . . The emission of alpha particles and beta particles is accompanied by the emission of gamma rays. These are similar to X-rays, but have a shorter wave length and a greater penetrating power. They are able to penetrate several inches of rock or steel. Different radioactive elements produce gamma rays of different qualities in the same way as different sources of light will give different colored light.

One of the outstanding properties of gamma rays is their ability to cause many gases which are normally perfect insulators to conduct electricity. They ionize the gas, and with a suitable electrode arrangement, cause a current to flow from one electrode to the other. This current is extremely small but may be amplified and recorded. The number of such discharges per unit of time is a measure of the intensity of the radioactivity. This intensity is variable. For example, in the Gulf Coast area the general level of radioactivity is comparatively low. In West Texas, however, the general level of radioactivity is much higher.

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Mud is then circulated rapidly and uniformly throughout the tank or pit by a turbine-type LIGHTNIN Mixer mounted over the mud.

You can add weight material sackful after sackful—as fast as you want to dump it in. You get an *immediate* rise in weight, throughout the whole mud system. A few seconds is all it takes to increase weight of every gallon of mud by the exact amount you want.

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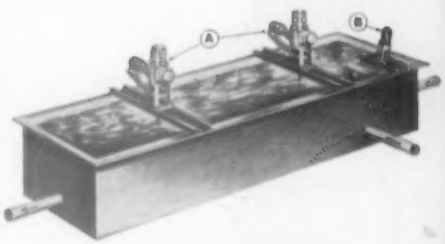

UNIFORM MUD—in a hurry. Weight and gel dumped in at the LIGHTNIN Flash Mixer (B) are distributed through mud IN A FEW SECONDS by one or two turbine-type LIGHTNIN Mud Mixers (A).

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by Louis J. Murphy

Charts for Simplifying Sucker-Rod Analyses—4

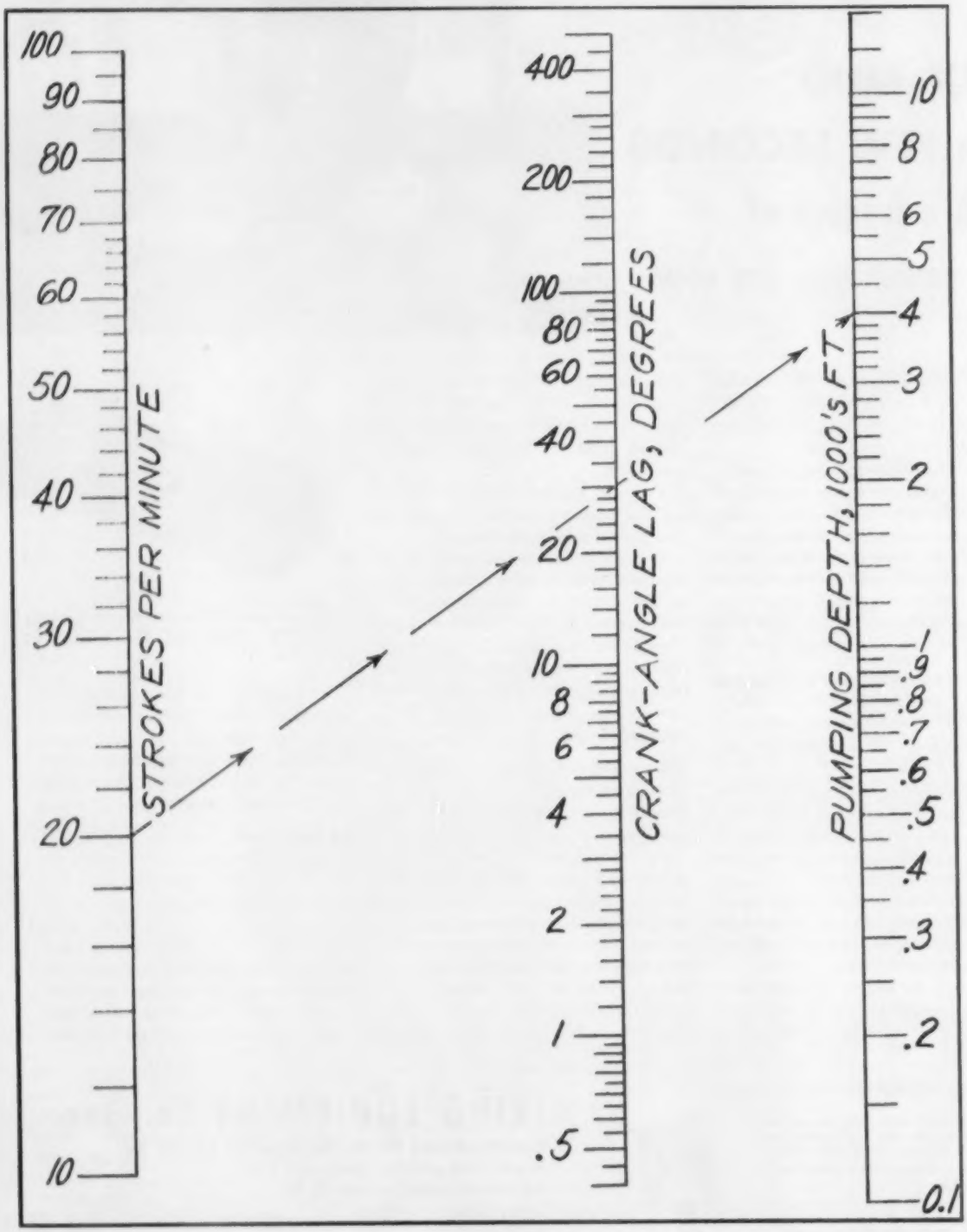

Fig. 3

How to Design In-Tank Jet Mixing Systems—12

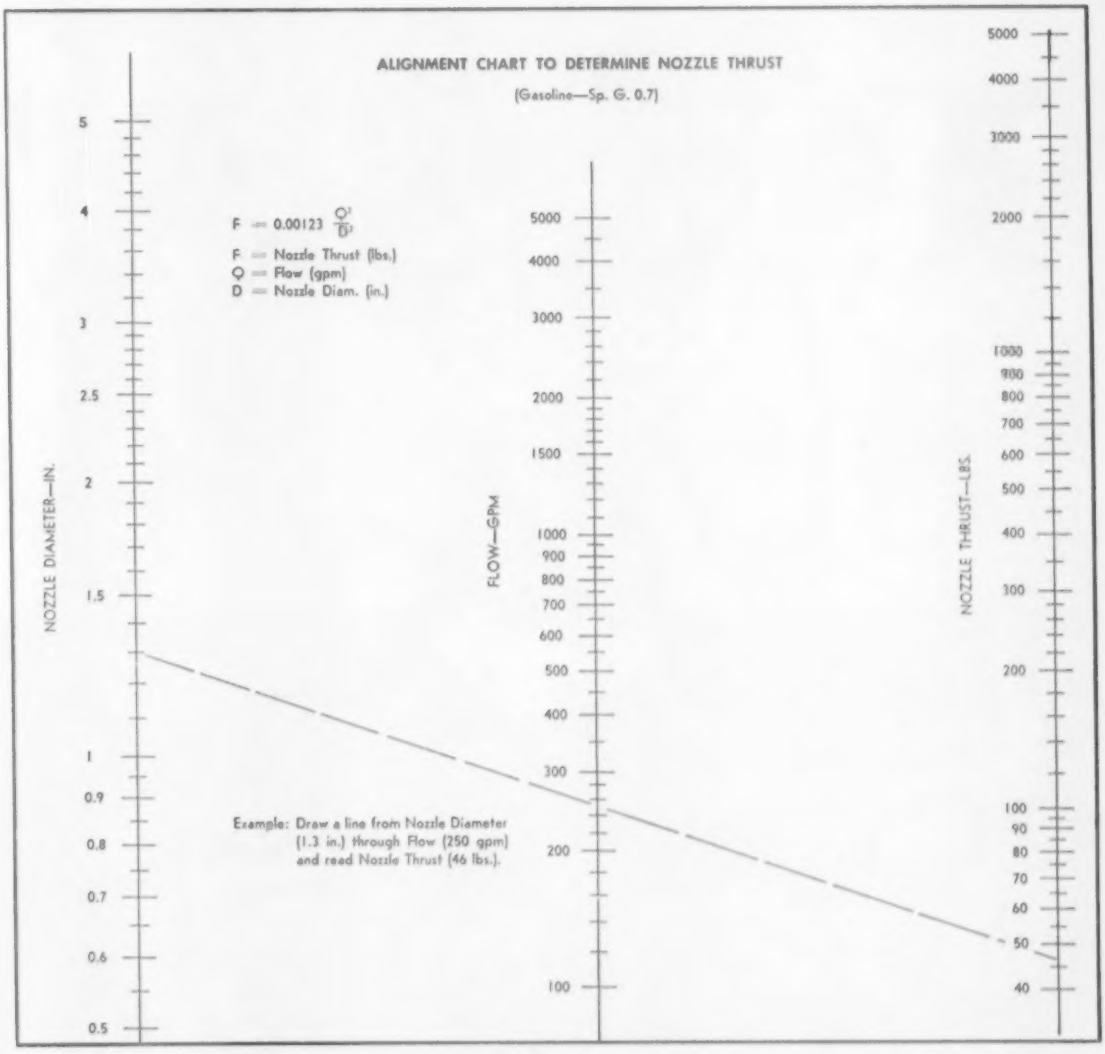
ALIGNMENT CHART TO DETERMINE NOZZLE THRUST
(Gasoline—Sp. G. 0.7)
F = 0.00123 Q²/D⁴
F = Nozzle Thrust (lbs.)
Q = Flow (gpm)
D = Nozzle Diam. (in.)
NOZZLE DIAMETER—IN.
FLOW—GPM
NOZZLE THRUST—LBS.
Example: Draw a line from Nozzle Diameter (1.3 in.) through Flow (250 gpm) and read Nozzle Thrust (46 lbs.).

Fig. 8

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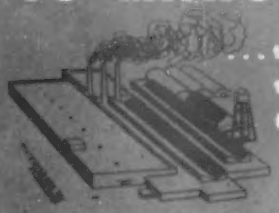

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George L. Chapman, Wolverine attendant at Hammond, Indiana, transmits pipeline operations data to New York over a Bell System teletypewriter circuit

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To find out how your communications efficiency could be improved, and costs lowered by using Bell System service, ask your Bell Telephone representative.

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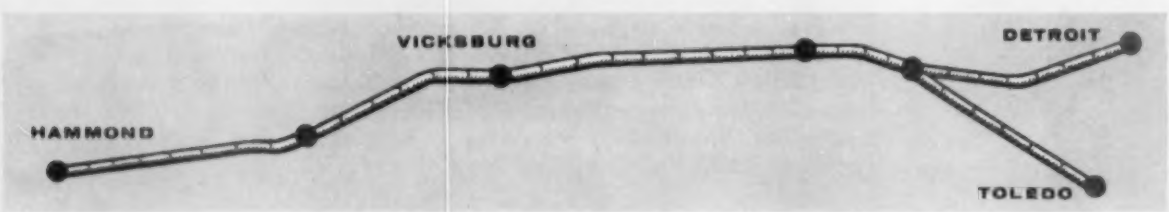

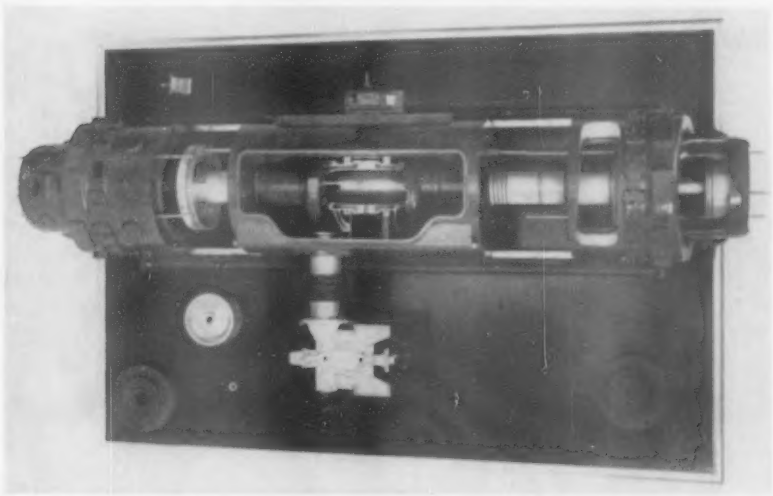

THE SIMPLICITY of the free-piston engine is evident in this cutaway that shows the combustion chamber, pistons, bounce cylinders, and turbine.

Free-Piston Gas Turbine

1. How It Works

by Robert P. Ramsey

MANY authorities on internal-combustion prime movers have believed for a long time that some combination of piston, combustion cylinder, and gas turbine—in one form or another—provides the best solution to the future of internal-combustion prime movers.

The free piston-turbine combination consolidates the principal assets of the opposed piston-combustion cylinder with the good points of the gas turbine, canceling out a large number of the wearing parts, such as crankshaft and the connecting rods, in converting linear motion to rotating motion.

These above concepts are in contradistinction to those of the all-rotating gas turbine which burns its fuel at lower pressures and, therefore, has lower over-all efficiency. The principle of gas turbines is basically simple, but if simple machinery is built, the inefficiency bars it from very many applications. To attain higher thermal efficiencies, the designers of the all-rotating gas turbine resort to multiple turbines and compressors with intercooling, reheat, and regeneration. Therefore an efficient, all-rotating gas turbine becomes a complex, expensive machine in gaining a few points of thermal efficiency.

Crankshaft engines have attained 40 per cent thermal efficiency. The all-rotating gas turbine with its complexities of intercooling, reheat, and regeneration have not equaled the crankshaft engine efficiency. The free-piston unit, with the turbine as the driving medium, attains the lowest number of reciprocating and wearing parts and has the efficiency of the piston-crankshaft-type engine.

It operates much as a steam plant with a turbine driving a load. It pumps hot exhaust gas under pressure from one or more gas generators as boilers deliver their steam, but without the necessity for using an intermediate force like steam between the source and the turbine.

The free-piston turbine runs on the exhausted combustion gases without the heat having to pass into steam. The exhaust gases serve their purpose directly in the free-piston turbine where the net work energy is extracted. There is heat remaining in the turbine exhaust which may be regained for auxiliary uses.

The free piston is very definitely an internal-combustion engine combined with an exhaust-gas turbine. Its usefulness exists today in the burning of natural gas and petroleum fuels, while the full usefulness of the all-rotating gas turbine may never be realized until nuclear power becomes a reality.

Mechanically simple . . . The greatest outstanding attribute of the free-piston engine is its essential simplicity. The elements of its design, which are attached to the free-piston principle, are absolutely trouble-free. For instance, the mechanism that keeps the pistons synchronized has never been known to give any trouble to any free-piston unit in service or on test. The pneumatic controls to regulate the stroke are taken from railroad braking systems and are simple and trouble-free.

The challenge to the engine designer lies wholly in the range of his greatest fund of experience. The fuel pump, while essentially the same as used on any diesel engine, requires special development for an oscillating drive. The piston must be thoroughly cooled, but since it replaces a number of pistons in a crank engine, the designer can afford to do an outstanding job. The same remarks hold true for the cylinder. There is a great deal of latitude in the cooling system and in the combustion-chamber design, and all of this can be taken directly out of the engine builder's art.

The free-piston turbine's future potentiality lies in its ability to convert tremendous energy releases by supercharging its own compressor and expanding outputs through greatly increased mass flow through the cylinder and the turbine. Extremely high outputs can be obtained without increasing temperatures to the turbine and without sacrificing high thermal efficiencies and durability. Without bearings and crankshafts, but with the ability to control compression ratios, the problem of pressures is a simple one.

The extreme simplicity of the machine should be evident from the photographs without further detail. It should

Editor's note: *This is the first of a series of articles on various aspects of the free-piston gas turbine, a prime mover which may become very important in the oil and gas pipeline industry. The series will give general facts about the machine, comparisons of efficiencies with other prime movers, and costs to be expected in installing and operating it in pump or compressor stations.*

Author is assistant to engineering vice president, Cooper-Bessemer Corp., Mount Vernon, Ohio. Series material is from a paper presented in Los Angeles at the petroleum division conference, September 1954, of the American Society of Mechanical Engineers.

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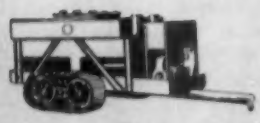

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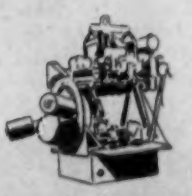

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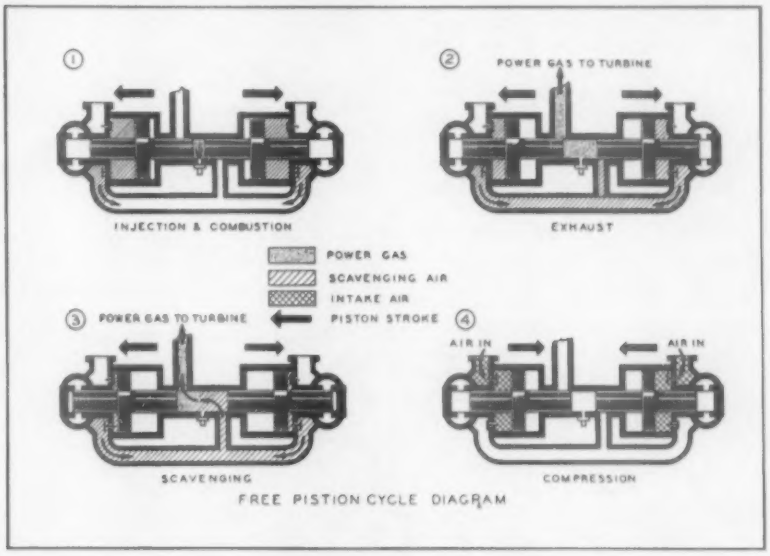

FREE PISTON CYCLE DIAGRAM

be pointed out, however, that the free-piston engine was designed for the easiest possible accessibility to valves and piston rings and all parts requiring inspection.

The cylinder assembly may be lifted directly out of the top of the engine and is light enough to be handled by an ordinary hand hoist. It drops into saddles in the main frame with centering rings for alignment. The entire compressor and piston assemblies may be quickly detached and moved back on rails, and the valves may be removed externally from cages without inconvenience. The head room is low and, since the machinery is vibrationless and relatively light in weight, it requires virtually no foundations other than a flat concrete mat with supporting walls.

In the free-piston cycle diagram on this page, the four different positions of the pistons throughout two complete strokes are:

1. Injection and combustion . . . The cylinder is of the opposed piston uniflow type. The first position shows the fuel being injected into the combustion chamber and the pistons are started on their outward stroke. Air which has been drawn into the large diameter compressor cylinder is being compressed and discharged through exhaust valves into the scavenging manifold. This air cannot enter the power cylinder because the piston covers the inlet ports. Similarly in the position shown, the exhaust ports are also covered by the exhaust piston.

2. Exhaust . . . The pistons are shown about half way on their outer stroke with the exhaust ports just opening. The inlet ports are still closed by the inlet piston. The combustion gas in the cylinder is starting to flow through the exhaust ports toward the turbine. It is not this particular blow down energy that drives the turbine; however, it supplies some of the power. On the outward stroke, air is being compressed in the bounce cylinders and energy is being stored just as kinetic energy is built up in a flywheel of a crank engine. The compressor pistons are continuing to discharge air into the scavenge manifold under pressure.

3. Scavenging . . . The pistons are still moving outwardly. This is perhaps the most important diagram to study because the most unique feature of the free-piston engine can be seen and properly understood. A great many people think that the exhaust energy as shown in Position 2 drives the turbine. However, in Position 3, it can be seen that the power pistons are still continuing their outward stroke. The scavenging air, under pressure, is flowing in through the inlet ports of the cylinder and pushing the exhaust gas through the exhaust ports to the turbine. In other words, the combustion push of the power piston is actually driving this air in behind the exhaust gases, and supplying most of the actual pressure energy to the gas column which in turn drives the gas turbine. This is not unlike the push of a power piston in a crankshaft engine, driving the connecting rod to turn the crankshaft. The efficiency of transmission of the cylinder energy to the load in the free-piston

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engine is about 92 per cent, while the mechanical efficiency of a crank engine is about 85 per cent.

4. Compression . . . The pistons are moving inwardly on compression stroke. The energy stored in the bounce cylinders on the out stroke now drives the pistons back on the compression stroke. Air is being drawn into the compression cylinder through its inlet valves and the air trapped in the cylinder is being compressed preparatory to Position 1 where the whole cycle starts again.

Controls . . . Since there is no physical crankshaft to fix the top-dead-center position of the pistons, the compression pressure would be regulated by the inward dead-center compression ratio. This ratio is determined solely by the energy conditions in the bounce cylinders. This is determined by a pressure-regulating railroad-type valve of rugged construction which is tied in with the engine governor.

An increase of bounce pressure will cause the compression pressure to increase. A decrease in bounce pressure will cause the compression pressure to decrease.

The outward stroke determines how much air is discharged by the compressor cylinder at turbine pressure, and this is a function of how much fuel is injected per stroke. The mass flow of gas through the engine is the thing that determines the power of the turbine. The longer the stroke, the greater the mass flow and the higher the pressure built against the turbine inlet nozzle. In this type of power plant the stroke length, rather than the speed or number of cycles per minute, corresponds to r.p.m. in a crankshaft engine. A small amount of fuel injected means a short outward stroke. The engine will idle down to the point where just enough air flows through for sufficient scavenging to maintain combustion.

Timing of fuel injection or ignition is tied physically to this bounce-pressure regulating valve and to the fuel throttle. In this manner, all three of these functions link together to follow the characteristic curve of a gas turbine.

General advantages . . . The free-piston gas turbine has been under development for several years. A 1,500 hp. unit is running on fuel oil, but it will also be developed for dual-fuel service and for natural gas. A smaller unit has been successfully operated on natural gas with spark ignition.

General characteristics of the machine are as follows:

1. Thermodynamically, its cycle is the most efficient obtainable.

2. Its small size means small buildings, light foundation, and lowest construction costs.

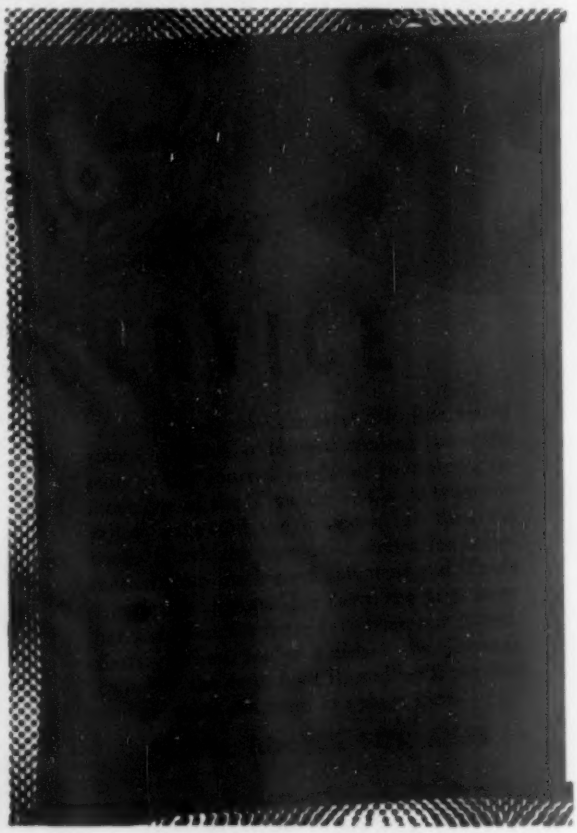
3. It assures maximum reliability because of the low number of parts and the low temperature of gas to the turbine.

4. It provides maximum flexibility since the gas turbine automatically increases torque under overload conditions and may be governed for any desired speed within design limits.

5. It has low maintenance cost due to a low number of wearing parts, the low-temperature materials used, and the absence of accessories such as regenerators, intercooling, or reheat.

6. It offers maximum durability because the engine is vibrationless and can be built very strong structurally due to its physical shape.

The free-piston turbine concept removes the most serious barriers to further advancement in piston-cylinder output, but the gas turbine is needed in the combination to accomplish this result. In turn, the gas turbine would do well to look toward the free-piston cycle to attain the high expansion ratio which is the key to high thermal efficiency.



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Fleeger-Riley Drilling Co., Inc., and its associated company, Star-State Drilling Co., announce the appointment of David H. Rankin as contract representative. Rankin's headquarters will be at Fort Worth. The companies maintain offices at Dallas, Midland, Odessa, Farmington, and Tulsa, in addition to Fort Worth.

Rankin, a graduate of the University of Nebraska, at Lincoln, entered the oil business in 1946 as advance representative and trouble shooter for a seismograph company. Since then he has had broad field experience in drilling and contracting, operating independently in five states.

Clegg & Hunt, Houston, will drill H. L. Hawkins' projected 14,500-ft. exploratory test, located in the extreme northwestern tip of Vermilion Parish, near the Jefferson Davis Parish line, in coastal Louisiana. The test, 2 State Lease 2438, will be a directional drilling job with bottom location under Mermentau River and surface location on the bank. It is 5 miles northwest of West Gueydan field.

Mobile Drilling Co., Mobile, Ala., has taken a contract from Temple Hargrove and associates, of Houston, for an 8,000-ft. test, 3 Missouri Pacific, to be drilled southeast of the old Westwego field, just southwest of New Orleans, in Jefferson Parish, Louisiana.

Kerr - McGee Oil Industries, Inc., Oklahoma City, has the contract for Pure Oil Co.'s new 14,000-ft. wildcat venture in the Gulf of Mexico. The test will be in Block 47, Eugene Island area, 15 miles offshore from Iberia Parish, Louisiana. It is 9 miles northwest of Eugene Island Block 45 field.

J. I. Roberts Drilling Co., Shreveport, La., has two new operations under way for Skelly Oil Co. in the Woodlawn area, northeast of Jefferson in Marion County, East Texas. One, 1 Cowherd, in B. F. Lynn Survey, is a wildcat, located a mile from production. It is projected to 7,000 ft. The other, in the field, is 1 Alvin Lewis, with a 6,700-ft. objective. **B. G. Byars Drilling Co.,** Tyler, Tex., also is drilling on a new Skelly contract in the same area at 2 Isaac Lewis, in the Clark Simmons Survey. It will drill to 6,900 ft.

New Illinois Drilling Firm

Gentles Drilling Co. is a newly formed drilling firm operating in the Illinois area with Mount Vernon as headquarters. Principal owner is A. W. Gentles. It is starting with a 4,500-ft. U-34 rotary rig. First hole is being drilled on contract for Will I. Lewis, Mount Vernon independent.

Herndon Drilling Co., Tulsa, is contractor on two new wildcat tests Toklan Royalty Corp. is starting in Illinois. One is Toklan's 1 South, in 1-5s-7e, 9 miles northeast of McLeansboro, in eastern Hamilton County, near the White County line. The other, 1 Floyd, is in 32-1s-10e, 5 miles west of Albion, in Edwards County.

J. B. Fletcher Drilling Co., Shreveport, is listed as the contractor on a 7,000-ft. Travis Peak exploratory test Norton Oil Co., Inc., also of Shreveport, is scheduled to drill in Fryeburg area, western Bienville Parish, northwestern Louisiana.

Atlas Drilling Co. has scheduled an 8,500-ft. test to be drilled for American Republics Corp. at 1 Kessler et al., on the east flank of Napoleonville dome, in Assumption Parish, Louisiana Gulf Coast.

El Dorado Drilling Co., El Dorado, Ark., has a rig running on a wildcat location a mile south of Mount Holly field, in western Union County, Arkansas. It is a Smackover test, projected to 7,400 ft. Contract is for E. G. Bradham, of El Dorado.

Crescent Drilling Co., Inc., Monroe, La., is starting another Smackover test for T. L. James & Co., of Ruston, La., in Antioch field, central Claiborne Parish, northern Louisiana. Location, at 1 Scaife, in 28-22n-5w, is 3,000 ft. northwest of Stanolind Oil & Gas Co.'s newly completed Smackover discovery well, 1 Washington, producing from a series of

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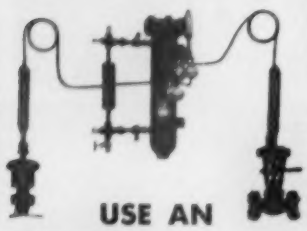

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Trant Drilling Co., Tyler, Tex., has contracted for a 9,600-ft. wildcat test in Trinity County, southeastern Texas. It will be drilled for P. R. Rutherford, of Houston, at 1 Lawson, in the Joseph Henderson Survey, 9 miles west of Groveton. Objective is the Woodbine sand.

Lyle Cashion Co., Jackson, Miss., is starting work on a projected 9,000-ft. test for Texas Gulf Sulphur Co. in Milam County, Southwest Texas. Location is 3½ miles west of Milano, in Jose Leal Grant.

Glasscock Drilling Co., Shreveport, is under contract for an 8,500-ft. test at a wildcat location on the east flank of Black Bayou field, Cameron Parish, Louisiana. John Mecom, of Houston, is the operator. The test, in 17-12s-12w, is projected to Discorbis and Marginulina sands recently found productive in other sectors of the dome.

Mallard Well Service Co. is contractor on a new 4,000-ft. operation in the North Cankton area, St. Landry Parish, southern Louisiana. It is J. E. Treadway's 1 Auguste, in 12-8s-3e. Treadway's rig in the field is under contract for a 4,400-ft. test being drilled for Robert L. Waterbury, of Baton Rouge, at 1 Prejean, in 13-8s-3e.

Wheless Drilling Co., Shreveport, is drilling for Continental Oil Co. on a projected 11,500-ft. exploratory test on the southeast flank of St. Gabriel field, in Ascension Parish, Louisiana Gulf Coast. Designation of the test is 1 Caldwell.

BBM Drilling Co., Houston, has taken on a 9,800-ft. contract for a wildcat test to be drilled for General Crude Oil Co. in Beauregard Parish, southern Louisiana. Location of the test, 1 Doornbos, is about 8 miles north of Longville field, in 14-4s-10w.

Conroe Well Service Co., Houston, is drilling for Sun Oil Co. at a wildcat location in the Rose Hill area, 5 miles southwest of Tomball, in northern Harris County, Texas Gulf Coast. Location is at 1 Beckendorff, in the William Hurd Survey. It is a 5,800-ft. test.

C. G. Glasscock Drilling Co., Corpus Christi, Tex., is drilling Sun Oil Co.'s new wildcat test in Matagorda Bay, offshore from Matagorda County, Texas Gulf Coast. Location is in State Tract 186, about 18 miles southwest of the town of Matagorda. It is 6 miles south of Matagorda Bay field, in Calhoun County. Objective is around 7,500 ft.

Ocean Drilling & Exploration Co., New Orleans, has taken on a contract for a 13,000-ft. exploratory test Shell Oil Co. has projected for its new South Pass Block 27 field, located in the Gulf of Mexico off the south tip of Plaquemines Parish, Louisiana. The contractor's rig currently is completing Shell's fourth well in the field, opened last August with production from a 7,500-ft. sand. Location of the new deep test is in Block 28, east of production.

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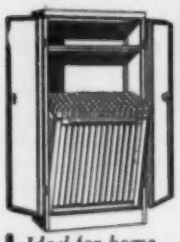

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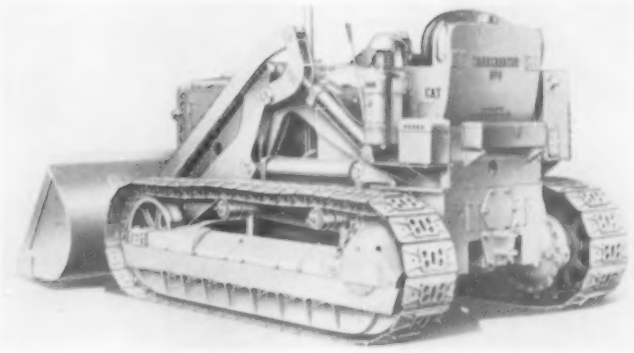


Caterpillar Improves Traxcavator

Increased horsepower and faster travel speeds are among the several improvements of the Traxcavator No. 6 shovel. This machine will give greater production with the new 2¼-cu. yd. bucket and improved bucket action with a new hydraulic pump.

The engine in the new No. 6 now delivers 100 hp. at the flywheel. In addition to the increased bucket capacity from 2 to 2¼ cu. yd., No. 6 shovels now have a two-position feature that allows maximum use of bucket capacity under normal conditions and obtaining of maximum scouring action and dumping action when handling sticky, hard-to-dump materials.

Traxcavator No. 6 shovel travels at almost 30 per cent higher speeds with increases from 1.4 to 1.9 m.p.h. in first gear, from 5.8 to 7.4 m.p.h. in fifth gear, and with corresponding increases in other gears. The new hydraulic pump increases the pressure in the hydraulic system to 1,450 psi. This operating pressure provides greater lifting power for faster bucket action. In addition, the hydraulic system in the new unit will be equipped with a full-flow filter. *Caterpillar Tractor Co.*

Check No. 1 On The Time-Saver Card

●

New Pumps Are Designed for Corrosive Chemical Service

BJ chemical pumps were specifically engineered for handling acids and other corrosive chemicals. Four basic pump sizes, available in various motor and impeller combinations, cover a capacity range from 20 to 400 g.p.m.

The complete pump rotating element, bracket, and stuffing-box assembly can be removed as a unit, without disturbing the suction or discharge piping. In addition, all parts are interchangeable, with the exception of the pump case and impeller. Thus a small supply of spare parts can serve a large number of working pumps. One basic stuffing-box and bearing-bracket assembly may be used for all four pump sizes.

Special corrosion-protection qualities of these pumps include a corrosion-resistant catch basin which is an integral part of the pump case; a molded synthetic-rubber, snap-on gland cover to guard against acid spray; and triple protection for pump bearings. This triple protection includes synthetic-rubber deflector and a stainless-steel labyrinth to guard against liquid entrance to the bearings and grease lubrication which provides greater protection against acid fumes.

BJ chemical pumps are available in a choice of two standard-material constructions, Alloy 20 for increased corrosion resistance and cast iron for general service. Available as special construction is the BJ mechanical seal in a new type engineered specifically for the particular demands of chemical pumping. *Byron Jackson Co., Pump Division.*

Check No. 2 On The Time-Saver Card

●

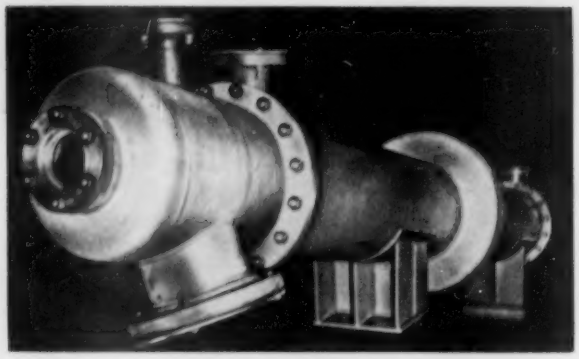
Fire Extinguisher Can Be Put Into Action Faster

A new streamlined fire extinguisher, designed primarily for industrial use, is capable of expelling 10 lb. of dry chemical. The new Ansul 10 answers a need for an extinguisher with a capacity between the company's 4 and 20-lb. capacity models.

The ring pin on the extinguisher is eliminated, thereby speeding up the job of putting it into action. Instead of having to pull a ring pin, the user now merely applies additional hand pressure to puncture the CO_2 pressure cartridge that activates the extinguisher. Other design changes include a new-style fill cap that is considered more effective in keeping moisture out of the extinguisher shell; a more practical and functional carrying handle that is less subject to vibration on vehicles and a new easy-to-operate, squeezable nozzle. *Ansul Chemical Co.*

Check No. 3 On The Time-Saver Card

What's New... Use the handy Time-Saver Cards



Semistandard Exchangers Offered

A new line of semistandard heat-exchanger units is designed to meet a wide variety of heat-transfer problems, yet numerous optional design features may be specified. The nozzles, for example, may be of any size or in any location required by the installation. Units may be specified with or without an expansion joint. The semistandard units are available in stainless steel or carbon steel. Other alloys are also available, though they may require a longer time for delivery.

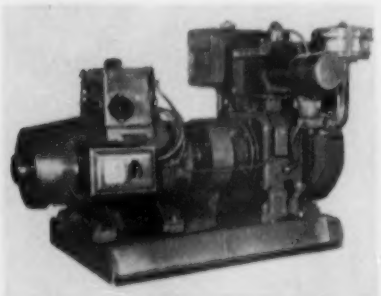
Thickness of the tube sheets is ¾ in. and up, and thickness of bonnets and channels is 3/16 in. Small stainless-steel nozzles are schedule 40 stub ends, with A.S.A. lap-joint flanges. The units have been designed for pressures of 150 psi. and higher, and construction details meet A.S.M.E. code specifications. *Buchen Co.*

Check No. 4 On The Time-Saver Card

●

Redesigned Plant Improves Weight-Capacity Ratio

An improved series of one-cylinder, air-cooled electric plants with capacities up to 2,200 watts includes internal improvements, resulting in 15 per cent greater capacity with a 60-lb. reduction in weight.



The new models, offered in both d.c. and a.c., are of a popular size for users requiring an ample source of power for both lighting and operating electric motors. Universal offers various types of controls, from manual rope-pull starting to electric starting, and fully automatic control where the plant automatically begins operation when any appliance or lighting of 40 watts or more is turned on.

Specifications of the plant are: weight, 270 lb.; length, 33 in.; width, 20 in.; height, 23 in. Power is supplied by a four-cycle, single-cylinder, air-cooled engine of 23-cu. in. displacement. The generator has a rating of 2,000 to 2,200 watts at 1,800 r.p.m. *Universal Motor Co.*

Check No. 5 On The Time-Saver Card

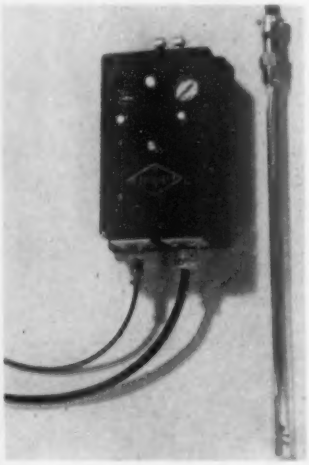
●

Capacity Level-Control Actuates Pneumatic Devices

Capacitive level sensing with electronic controls terminating in air-pressure variations suitable for operating a pneumatic-diaphragm control valve are combined in a new Belmont Model DP level control.

Applicable to most nonadhesive chemicals, oils, and all condensed gases over a temperature range from +500° to —425° F., the control derives a sensing signal from an inert capacitive-type probe capable of being operated in applications ranging from high vacuum to pressures as great as 100,000 psi. The probe is connected by coaxial cable to the electronic circuitry which can be located as far as 1,000 ft. from the sensing point.

Responding to a rising or falling level around the probe, the electronic unit actuates an air-pilot valve which modulates a 15-psi. air supply over a range from 3 to 15 psi. This pneumatic signal can be used directly to actuate small control valves or, where greater volumes of air are necessary, can be fed into auxiliary control equipment.



The control unit includes a meter for observation of the output of the electronic control unit, and an air-pressure indicating instrument for observation of valve operation. Panel-front controls located under screw-on dust-protective caps provide for coarse-level adjustment, fine-level adjustment, and differential in range of control. *Thermo Instruments Co.*

Check No. 6 On The Time-Saver Card

●

Automatic Shutoff Valve Acts As Back-Pressure Unit

The L-K automatic shutoff and back-pressure valve is designed for use in running oil from lease tanks or batteries into main lines or stock tanks, and automatically shuts off when the fluid that is being run out reaches a predetermined level. In operation it is set on the flow line a short distance from the tank or battery.

Weights applied to the valve offset the static pressure of the oil within the tank so that when the oil in the tank reaches a predetermined level, where the static weight of the oil flowing through the valve is less than the weight on the valve, the weight closes the valve. A piston, working inside a cylinder above the valve, and having an extension resting on top of the valve, serves the purpose of balancing the vacuum on

the downstream side. The downward pull of the vacuum on the piston, and the upward pull on the valve offset each other. This permits the differential weight, bearing down on top of the valve through the piston, to close the valve when the pressure from the tank becomes less than this weight. As this valve is closed, it immediately becomes a back-pressure valve.

If this valve is on a line between the battery it is serving and other batteries that do not have it, when the pressure from the other batteries becomes greater than the static pressure from the one it is serving, it will automatically shut off and become a back-pressure valve.

When the pressure on the downstream side diminishes to where it is less than from the tank it is serving, it will again open and continue to flow until the point of setting is reached. *L-K Pump Valve Co.*

Check No. 7 On The Time-Saver Card

Rotocycle Meters Designed For Corrosive Applications

A new series of stainless-steel Rotocycle meters is designed especially to handle corrosive liquids. The series includes 2-in., 100-g.p.m. and 3-in., 200-g.p.m. bulk-plant models and 2-in. pipeline models. All wetted meter parts are made by Type 316 stainless steel. Bushings are of hard carbon, ball bearings of stainless steel.

Other new features include a new optional meter-strainer arrangement, a new-style temperature compensator and a new vapor seal and adapter. A new accessory, a multistage quantity-control valve is also available in Type 318 stainless. The Type B strainer may be mounted in the conventional meter-base position or on top of the meter, serving as a liquid trap. The liquid trap

What's New... Use the handy Time-Saver Cards

arrangement is recommended for metering of highly corrosive liquids to prevent oxidation caused by complete meter drainage. It also prevents meter contamination by keeping the meter filled with liquid when the strainer is cleaned.

The temperature compensator consists of a flexible tubing which transmits liquid temperature changes from a temperature bulb in the chamber to the meter head. Sensitive bellows in the meter head, expanding and contracting with temperature fluctuations, actuate a microadjustment, which acts as a variable speed device regulating registration to a desired liquid temperature base. An additional bellows in the head is sensitive to ambient temperature changes. *Meter and Valve Division, Rockwell Manufacturing Co.*

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Simple and adaptable in design, GLITSCH "Truss-Type" lightweight trays can be designed for any process requirement with respect to tray size, process layout, type of flow, type and shape of downcomer, weirs, wells, and size and shape bubble caps as well as suitable corrosion resistant materials.
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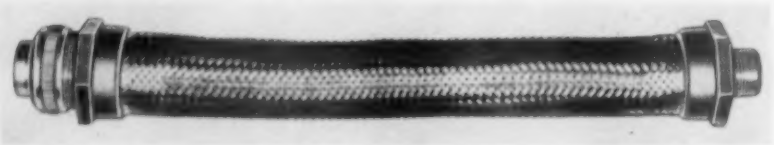
Wiring Coupling Is Explosionproof



A flexible coupling has been designed for safer wiring of installations in vibration areas. Whether for the hanging of explosionproof fixtures, or for installation of motors, these couplings are explosionproof, can't shake loose, and are U.L. approved. The base and fittings are made of solid brass. They are available in all combinations of hubs. Conduit diameters range from ½ to 2 in. in any length. Killark will make to order any coupling size or diameter necessary to meet a particular installation. *Killark Electric Mfg. Co.*

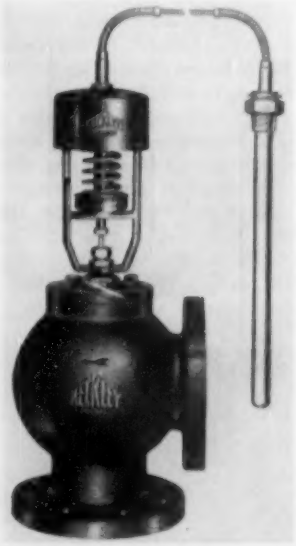
Check No. 9 On The Time-Saver Card

New Temperature Regulator May Be Mounted on Vessels

A new line of angle-type-T temperature regulators may be mounted directly on heat exchangers, that have inlet connections on the top thus saving piping and installation labor.

The new regulators have wearing parts of stainless steel or bronze that can be renewed. The regulator has an overrun feature for protection of the thermal element in the event temperature at the bulb exceeds the range of the regulator. A two-ply bellows is used in the thermal unit for added power and longer life.

Body is bronze or semisteel. All trim is either bronze or stainless steel. It is available with screwed connections in sizes from ½ to 2 in. and with flanged connections in sizes from 2 to 8 in. All ½ to 4-in. sizes are spring-loaded and all sizes from 6 to 8 in. are weight-loaded. *O. C. Keckley Co.*



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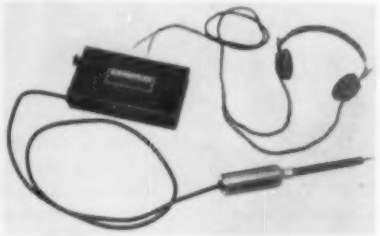
Sound Probe Locates Equipment Defects

The electronic sound probe is an instrument which changes vibrations into electrical energy, multiplies sound volume, and transmits directly into earphones. This compact electronic tool



enables users to correctly diagnose and locate trouble spots in any mechanically operated piece of equipment.

Through natural reproduction of noise at the source, with no distortion, because all foreign or built-up sounds are absent, the operator is able to identify and locate the mechanical trouble, thereby saving time and money by avoiding serious and costly shutdowns.

The amplifier unit is contained in a black wrinkle-finish metal box. Plug-in type earphones are used in connection with the amplifier for listening to the noises or mechanical disturbances which are to be contacted. *Gel-Me Co.*

Check No. 11 On The Time-Saver Card

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ the Time-Saver Cards.

Precision-Fabricated Heat Exchangers for any process-industries application, involving gas to gas, liquid to liquid, liquid to gas, powered solid to liquid, high pressures to vaccum, and temperatures from 280 to 1,600° F., are described in a new 12-page booklet. All major types are available, including exchangers and coolers, condensers, waste-heat boilers, tubular reactors, reflux sections, catalyst coolers, and high-pressure gas coolers. *M. W. Kellogg Co.*

Check No. 12 On The Time-Saver Card

●

International Power Unit ranging from 16.5 to 200 net hp. are featured in a new 12-page catalog E-14-E. Complete information is given on all 18 heavy-duty engines in the IH line: five four-cylinder carbureted units, seven six-cylinder carbureted units, and six diesels in four and six-cylinder models. *International Harvester Export Co.*

Check No. 13 On The Time-Saver Card

●

Price Comparisons—Clad Steels vs. Solid High Alloys. Dollars-and-cents facts about the economies, possible in the use of clad-steel plates, are contained in an easy-to-read publication. The booklet discusses 16 standard alloy claddings on a variety of backing steels and shows clearly how the designer and fabricator can realize significant savings in equipment costs. *Lukens Steel Co.*

Check No. 14 On The Time-Saver Card

●

Single-Stage Steam-Jet Vacuum Pumps. High vacuum gas handling without moving parts are features of single-stage, steam-jet vacuum pumps described in new Bulletin 5-E. This bulletin discusses application, construction, and operation of the equipment, and includes performance data and sizing tables. Operating instructions are included as well as numerous applications of interest to process industries. The bulletin discusses pumps ranging from maximum air-load capacities of 1.7 to 8,650 lb. per hour. Among the applications included are filtration, distillation, mixing, heating, and vacuum transfer. *Schutte & Koerting Co.*

Check No. 15 On The Time-Saver Card

●

Malleable Couplings is a new 16-page, illustrated folder on malleable pipe couplings and fittings. Photographs demonstrate the savings in time and labor made by Rolagrip couplings for plain-end pipe and Gruvagrip and Gruvajoint couplings for grooved pipe. Diagrams and complete specifications for these products, as well as Gruvagrip fittings, are included. *Gustin-Bacon Manufacturing Co.*

Check No. 16 On The Time-Saver Card

●

Data on Porous Stainless-Steel Alloys. Types, performance, and application data for stainless steel and other metals with controlled porosity are available in a new brochure, issued by Micro Metallic Corp. Properties of available porous metals, including Types 304 and 316 stainless steels, nickel, monel, stellites, and other alloys are presented in the new 45-page booklet. Included are also data on the various porous stainless-steel filter elements and containers, some with filter areas up to 1,000 sq. ft. *Micro Metallic Corp.*

Check No. 17 On The Time-Saver Card

●

Turbine Pumps for Industry. A completely new hydraulic and mechanical design is featured in recent additions to the industrial vertical turbine-pump line. This new design incorporates a new impeller type, producing higher head and efficiency with extremely low N.P.S.H. These pumps are available in 10, 12, and 14-in. sizes, covering the range from 400 through 2,100 g.p.m. *A. O. Smith Corp., Hydraulic Products.*

Check No. 18 On The Time-Saver Card

●

Micro-Blanks. A new 12-page catalog gives dimensions and specifications for a standard series of line blinds made under the trade name, Micro-Blanks. From this catalog a standard line blind can be selected to meet any requirement, and may be ordered by code number. *M. N. Aitken Co.*

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●

B. & W. Seamless or Welded Stainless Mechanical Tubing. This six-page folder outlines the many advantages offered to design and fabrication engineers who consider tubing in the production of parts and products which

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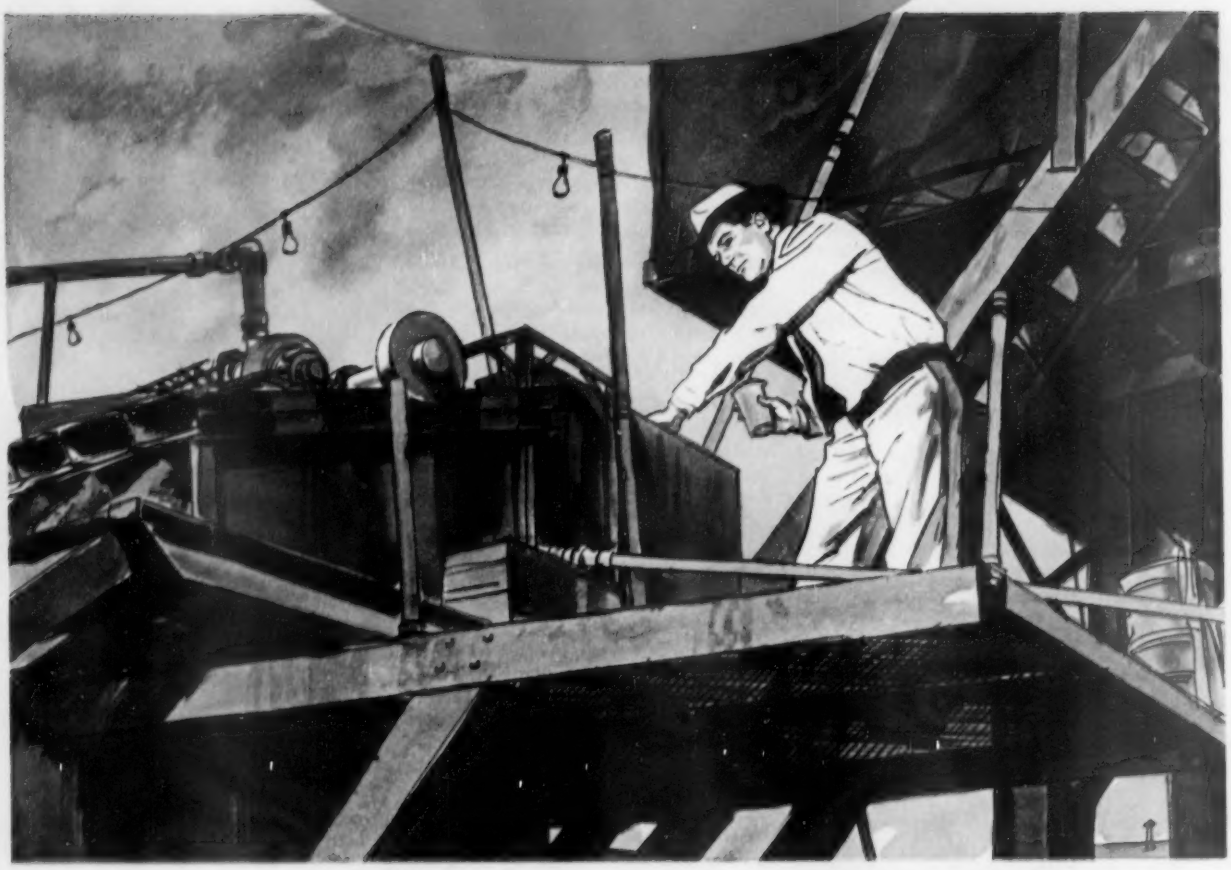

This man has no regular working hours.

He may drive 10, 25, 50 or a hundred miles to work every day through all kinds of weather.

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they manufacture. In addition to defining the many finishes, size ranges, types, and shapes of stainless tubing available to industry, the folder contains a table of condensed properties and processing data for nine popular grades of stainless tubular products. *Babcock & Wilcox Co.*

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●

"Chalk Rock Oil" by C. R. Jordan, an eight-page illustrated article on primary and secondary recovery through modern methods from Annona chalk in Pine Island field of Caddo Parish, Louisiana, is the lead article in the fourth-quarter issue of "Tomorrow's Tools — Today!" "Below the Ellenburger" by Aaron W. Cook, a story of a prolific area in West Texas and "Lane-Wells Correlation Study of Southeastern Kansas" by Jack Cruce are likewise of interest to oil men. *Lane-Wells Co.*

Check No. 21 On The Time-Saver Card

●

Chemical Cleaning of Petroleum Equipment. Detailed directions for 28 different cleaning and safety operations in the six divisions of the petroleum industry are contained in the 14-page, indexed manual. *Wyandotte Chemicals Corp.*

Check No. 22 On The Time-Saver Card

●

Pressed Steel-Products Stock List. Issued monthly, this 12-page stock list giving a detailed report on stocks of A.S.M.E. code heads, weld caps, riser caps, manway cover plates, manway rings, storage tank manways, and seamless-steel welding reducers. Shapes, quantity, outside diameter, wall thickness, and material are listed for each item. *Hackney Iron & Steel Co.*

Check No. 23 On The Time-Saver Card

●

Chemmuniqué. Published every two months, the November-December issue of this communique to chemical-processing industries features two short articles of interest to the oil industry. One is about Darco, an additive used in cementing to absorb antisetting ingredients in the mud previously used. The second article is about Arpet 931, a chemical used to break water blocks in oil wells. *Atlas Powder Co.*

Check No. 24 On The Time-Saver Card

●

Comprehensive Catalog. A new 58-page, case-bound, general catalog on industrial rubber products is fully illustrated and printed in color. It is divided into sections for quick reference to a particular product or group of products. There are sections on belting, hose, packing, and moulded rubber products. Each of the products mentioned in the catalog is illustrated in a cutaway section and described adjacent to the photo. Performance data, specifications, and sizes are included in all sections. Charts on sizes, working pressure, weights, and all necessary technical information are included in the section on industrial hose and packing. *Quaker Rubber Corp.*

Check No. 25 On The Time-Saver Card

New Oil-Industry Catalog. Complete information covering oil-industry accounting and field forms, well logs, geological records, plat sheets, map weights, map sticks, and steel filing equipment for maps and logs is shown. Descriptive material and illustrations are easily found in catalog No. 1154-K, with the aid of three separate indexes. Each item is classified alphabetically, numerically, and functionally. Two hundred and two pages in all, the new catalog contains over 400 individual illustrations and information concerning more than 800 items. *Ross-Martin Co.*

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Here's why YOU SHOULD

CONTROL CORROSION WITH Chromates

no other chemical is as powerful an inhibitor against the corrosive action of water on iron or steel.

no other chemical is as effective against bimetallic corrosion.

no other chemical provides as satisfactory protection in high-chloride water or brines.

no other chemical completely nullifies the corrosive effect of aeration.

Mutual Bichromates and Chromates are being used as corrosion inhibitors in an ever-increasing number of applications. In most instances the amount of chromate is so small and the cost so low when compared to the value of the equipment protected that chromate is preferred over other inhibitors.

Typical uses for Mutual Chromate corrosion inhibitors are in cooling towers, heat exchangers, condensers, engine and compressor jackets, boilers and idle equipment, hydraulic systems and refrigerating brines. Write to our Research and Development Division for recommendations for using Chromates in your equipment or process.

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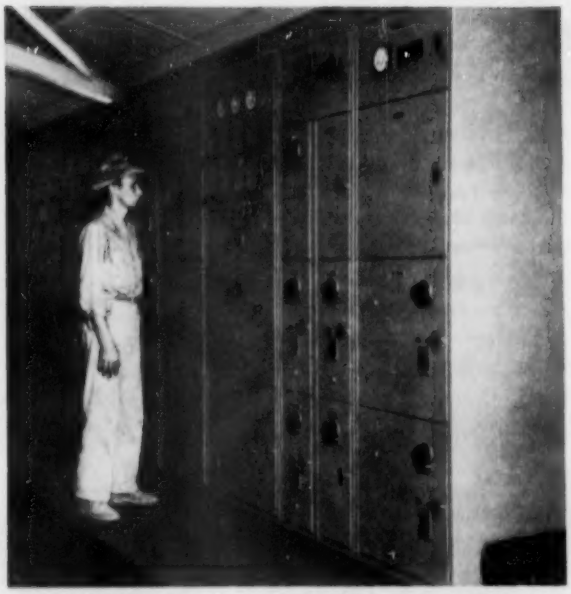
EXTRA POWER is available from G-E gas turbines. Performance records of gas turbines installed throughout the country show that the turbine is capable of 25 per cent more horsepower in cold weather—5700 hp is the rating at 80 F and it increases to 7100 hp at 40 F. Simple buildings can house the gas turbine . . . the building can be small in relation to the available horsepower.

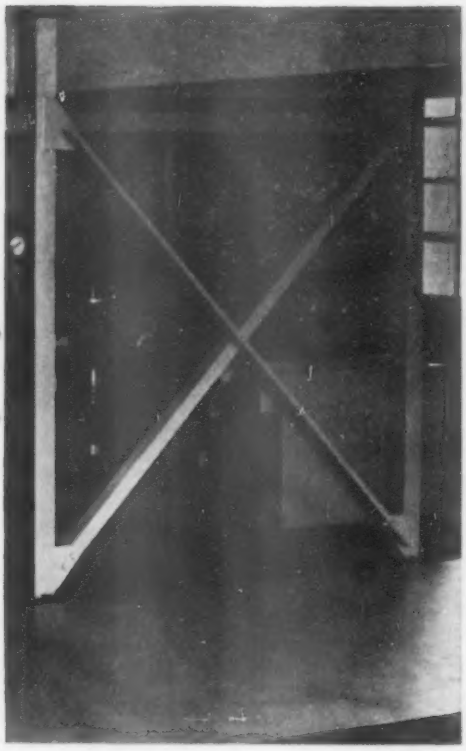
G-E gas turbine's flexibility helps

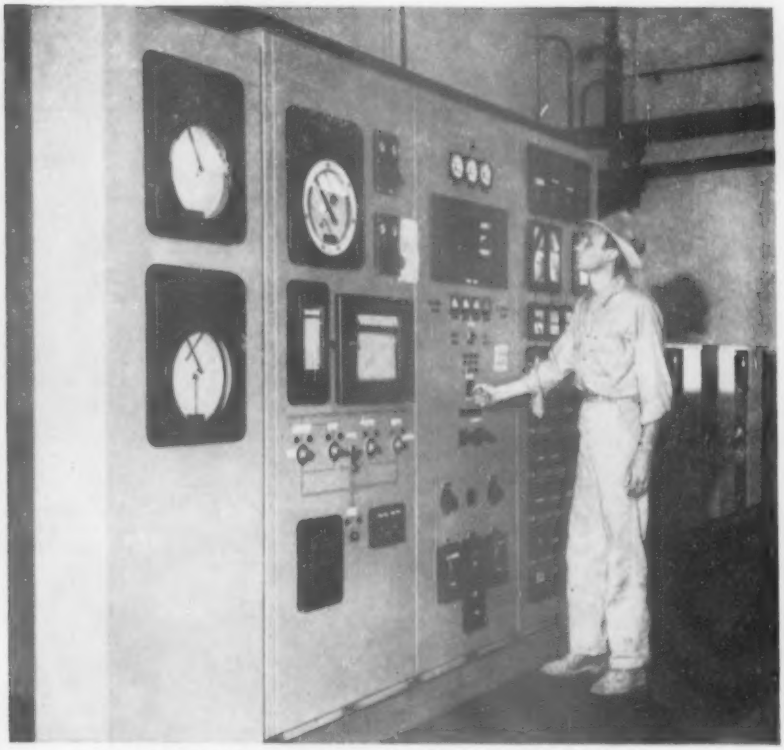


CUSTOM-ENGINEERED low-voltage motor control is provided by G-E Cabinetrol°, made of standard enclosures and components assembled specifically for Seneca station.

°Reg. Trade mark of General Electric Co.

INCREASING THE EFFICIENCY of the gas turbine is this regenerator (supporting stack), which "recaptures" the waste heat. This is economical even at low load factor.





OPERATION IS SIMPLIFIED with this convenient G-E control equipment. It includes a starting and supervisory control for the turbine, station valving and station pressures. Compact unit is factory-assembled.

Seneca station meet load changes

Atlantic Seaboard puts G-E gas turbine to work on pipeline having widely varying flow and pressure conditions

Changing weather and temperatures in Washington, D.C. make Atlantic Seaboard's Cobb-Rockville pipeline load vary widely. The task of moving the gas to meet the varying load demands is successfully met by Seneca's centrifugal compressor, driven by a General Electric 5000-hp combustion gas turbine.

It must start, stop, and adjust pressures and flow very often, but the versatile G-E gas turbine maintains desired conditions by adjusting its speed as necessary.

G-E engineers, working with Atlantic Seaboard engineers from the start, helped co-ordinate all the Seneca station's electric equipment with the gas turbine. Deliveries were carefully planned to dovetail with station construction schedules. Operators were briefed by G-E field service engineers before and during start-up.

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EQUIPMENT MEN . . . in the News

Oilwell Expands Harvey, La., Facilities

Oil Well Supply Division of U. S. Steel Corp. has completed a large scale expansion and remodeling program at its Harvey, La., facilities, according to M. F. Jones, manager of Oilwell's Gulf Coast area. In foreground is a modern new building which now houses store and offices. The new structure released space in the rear of the existing building for expansion of warehousing operations to serve the Louisiana delta area's growing oil-field activity. The latter unit, which formerly housed the Harvey store, has been completely remodeled. The expanded facilities have approximately 5,300 sq. ft. of floor space.

Brakesol Moves Cranford To Rocky Mountain Area

The transfer of Buford Cranford, sales engineer, to the Rocky Mountain territory with headquarters in Casper, Wyo., has been announced by Lester Brake, president of Brakesol, Inc., Oklahoma City. Cranford was formerly headquartered at Fort Morgan, Colo., and previous to that time had worked in the Oklahoma territory for several years. Cranford's experience has been as a consultant on all paraffin problems in the oil fields.

Walton Appointed Executive Vice President of Ideco

G. W. WALTON

The promotion of George W. Walton to executive vice president of Ideco Division of Dresser Equipment Co., one of the leading manufacturers of oil-field drilling and well-servicing equipment, has been announced by J. B. O'Connor, executive vice president of Ideco's parent company, Dresser Industries, Inc., Dallas. In addition to his over-all administrative responsibilities, Walton will continue to concentrate on both domestic and foreign sales.

Entering the petroleum industry 35 years ago as an oil-company purchasing agent, Walton later served as sales and export representative for various oil-well-equipment companies. He was one of the pioneers in export sales of oil-field equipmnet and was one of the first to set up headquarters abroad in London and other countries.

Walton's long career includes executive export-sales and management assignments to the four corners of the world that have taken him the equivalent of 28 times around the world by air.

Enterprise Appoints Two Men to Key Positions

R. E. Kroeck has been appointed to the position of manager of manufacturing, and B. A. Robbins to manager of engineer, both of the Enterprise Division, according to an announcement by John Sheusner, manager of operations of Enterprise Division, General Metals Corp.

Kroeck has a background of 30 years with the company. Prior to his new assignment he was manager of production control and purchasing.

R. E. KROECK

B. A. ROBBINS

Robbins has been with Enterprise since 1947, having started as a material and process engineer. He held the positions of chief products development engineer prior to his new assignment. Before joining Enterprise he was connected with General Electric Co. at their Lynn, Mass., plant for 6 years.

Tuloma Builders to Construct New Tulsa Plant

Tuloma Builders' proposed headquarters building.

Tuloma Builders, Inc., Tulsa, has announced plans for a new, three-building headquarters southeast of Tulsa.

Clyde W. Wyant, president of the engineering and construction firm stated one of the buildings will be a two-story structure, and will house offices and work areas for the firm's engineers, and the other buildings will be used for warehousing, equipment maintenance, welding and fabrication. The office building will incorporate a total of 7,000 sq. ft. of floor space on both floors. The two warehouses, shop, and fabrication buildings will be 40 ft. wide and 100 ft. long, giving a total of 8,000 sq. ft. of space.

When the new facilities are constructed, Tuloma will fabricate many construction items in its Tulsa plant, and ship them to points of installation. According to Wyant, Tuloma has previously fabricated the items at plant sites, but has also experimented successfully with prefabrication on two recent projects.

Tuloma, formerly part of Midwestern Contractors, Inc., was formed last

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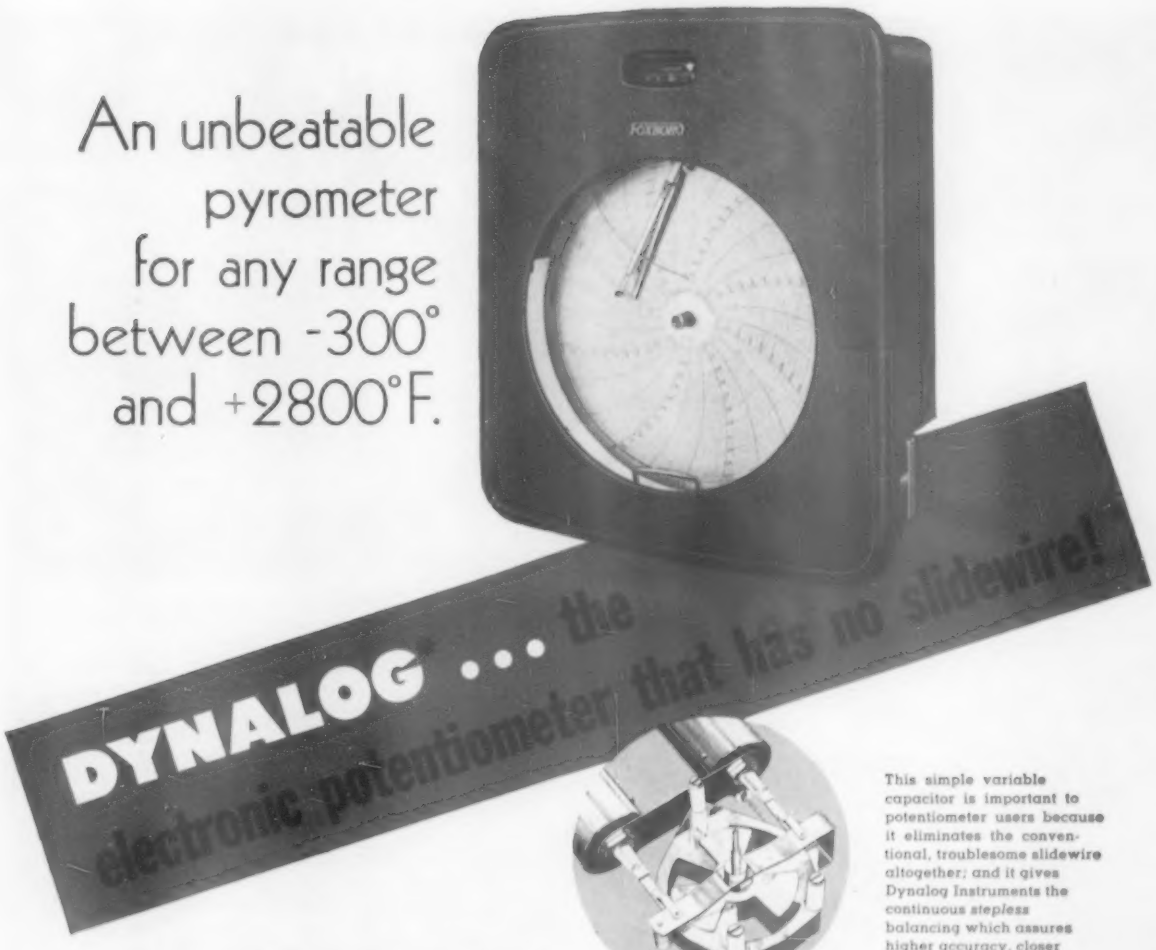

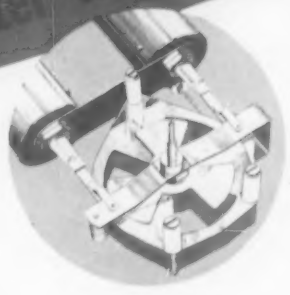

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TOPS in simplicity . . . unequalled in its combination of accuracy, sensitivity, and speed of response . . . the Dynalog Potentiometer with standard thermocouples gives you unerring temperature measurement for any range up to 2800°F. Featuring *sustained* accuracy of ¼ of 1% of scale, it's an instrument of laboratory precision built to withstand the severest industrial conditions.

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Dynalog Potentiometers are also used for the measurement of pH, oxidation-reduction potential, and for other applications in which the process variable can be converted to a dc millivolt signal. They are available for pneumatic or electric control.

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FOXBORO POTENTIOMETERS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

August. Wyant and other top Tuloma executives were formerly with Midwestern. Tuloma constructs gasoline, industrial, and chemical plants, gas compressor and oil-pump stations, and water-flood units.

Baroid Makes Mohr Manager, Pacific Coast Division

E. L. MOHR

E. L. Mohr, Jr., has been appointed manager, Pacific Coast division of Baroid Division, National Lead Co., it has been announced by G. B. Coale, general manager.

Mohr succeeds W. L. Heater who is appointed assistant to the manager, drilling-mud department. Mohr joined Baroid as well-logging engineer in 1941 and was transferred to the drilling-mud department in 1943, as service engineer.

During his employment at Baroid, Mohr has served as district superintendent; general superintendent, Pacific Coast division; and assistant manager, Pacific Coast division. In his new assignment, Mohr reports directly to the manager, drilling-mud department.

Bovaird Supply Reelects Officers at Annual Meeting

Reelected officers of Bovaird Supply Co. are: seated: E. A. Booth; D. D. Bovaird; and R. G. Ayers. Standing: R. M. McMahan; R. E. Batchelor; and Bradford J. Williams.

Completing its eighty-fourth year of continuous service to the oil industry, Bovaird Supply Co. stockholders have held their annual meeting in Tulsa and reelected the following board of directors: Davis D. Bovaird, president; Roscoe G. Ayers, vice president and general manager of sales; R. M. McMahan, secretary; R. E. Batchelor, general manager of stores; A. E. Booth of Bradford, Pa., and Bradford J. Williams of Tulsa.

The directors reelected T. H. Trower as treasurer and M. B. Park as assistant secretary-treasurer. It was the largest stockholders meeting the company has held, and all of the district managers were in attendance. Reports were made on senior departments by Ayers, McMahan, Batchelor, William J. Bovaird, and Trower.

District managers attending the meeting were: F. J. Robbins, Oklahoma; F. H. Rudrauff, Illinois; R. W. Robbins, Kansas; R. E. Whitten, Texas Panhandle; and J. A. Kennedy, West Texas and New Mexico.

With the opening of two new stores at Liberal, Kans., and Abilene, Tex., during 1954, Bovaird now has stores and offices in 23 cities.

Pacific Western Opens Canadian Headquarters

Pacific Western Mud Service, Ltd., a recently founded drilling-mud firm, organized by a group of Texas men, is opening its Canada headquarters office in Calgary, Alta. The company is operating in Canada under a franchise from Milwhite Mud Co.

Kenneth L. Ballard, formerly with Milwhite in Midland, Tex., is president of Pacific Western Mud Service. Other officers and directors of the firm, all of Midland, are H. L. Brinson, Joe S. Hill, W. W. Meeker, and Henry D. Lindsley III.

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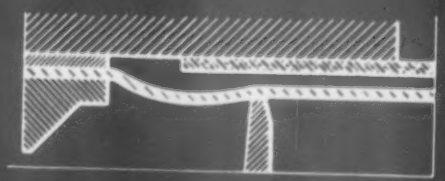
Solve FREEZING Problems with S&J "TITE-SEAL"

The Shand & Jurs "Tite-Seal" Breather Valve, illustrated here, is the practical answer to breather valve freezing problems. It incorporates a unique pallet design for both pressure and vacuum relief valves. The design utilizes a pliable diaphragm which provides the tightest possible seal through a novel balancing action. When venting, this diaphragm design provides a peeling action between the pallet and the seat, that overcomes sticking or freezing to a very marked degree.

The "Tite-Seal," Fig. ST-7575, is supplied with pliable, reinforced, synthetic rubber coated diaphragms for moderate climatic conditions, and with special diaphragms of Teflon coated fiberglass for extreme freezing hazards. The latter has been tested by impartial laboratories, government agencies, and by independent research organizations, and has been found to require only ¼" of water beyond normal setting to break ice. Yes, S&J "Tite-Seal" is the answer to your breather valve freezing problems.

S&J "Tite-Seal" in action. Typical pallet shown at the right. In operation, tank pressure is directed through a port to a chamber outside the periphery of the seat but inside the periphery of the pallet. This produces a slight ballooning which effects a perfectly tite-seal at all pressures below that for which the pressure pallet of the breather valve is set to open.



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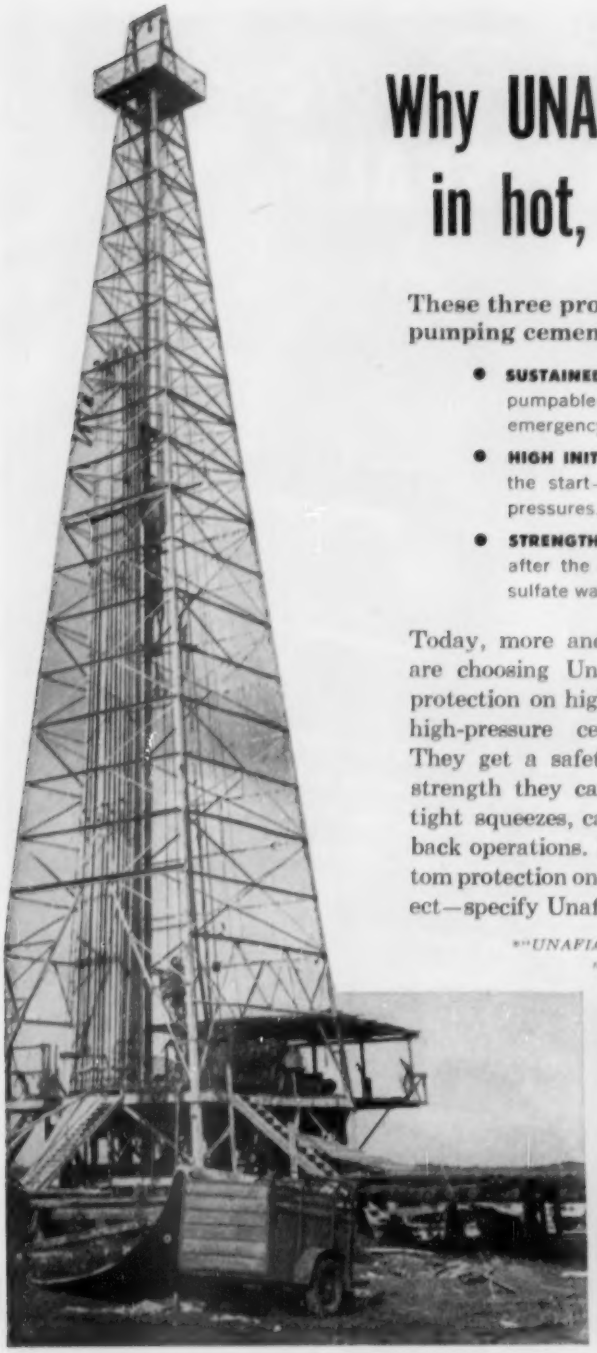

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SEND FOR FREE BULLETIN — Gives general information and typical data tables on Unaflo's well-bottom performance as well as that of our other cements. For your copy write: Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Avenue, New York 17, N. Y.

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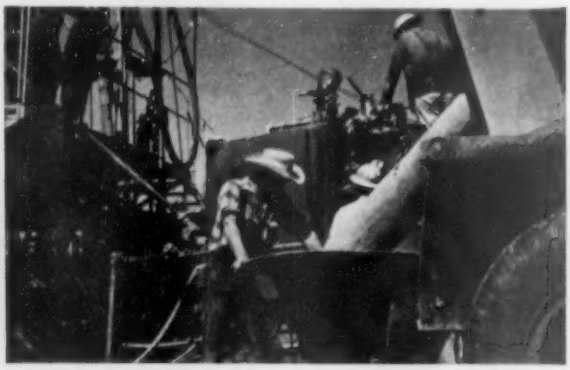

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EXPLORATION

Oil Search Extends To Cod Country

by John C. McCaslin

AN eastern Canada oil company and a southern Kansas operator have announced jointly the signing of a contract for drilling for oil and gas on an extensive crown lease covering about 10,000 sq. miles in the eastern half of New Brunswick in the Canadian Maritimes. The contract, entered into by New Brunswick Oilfields, Ltd., and Orville H. Parker, has been approved by the provincial government of New Brunswick.

The drilling contract calls for a minimum of six wildcat holes in the area. The first test must be started by March 1. The sixth well must be finished not later than 500 days after that date. Cost of this initial drilling program will be about $750,000.

The Canadian oil firm has been producing oil and gas in New Brunswick since the discovery of the province's only oil field in 1909. The firm also operates a small refinery in New Brunswick.

Oil Not New for Area

Oil and gas are not new to this Maritime province. Seeps were reported in the southern part of New Brunswick in the nineteenth century. Several wells were put down without success not long after Drake's Titusville discovery. Late in the last century the area's albertite formation was mined to manufacture oil and gas for lighting purposes. Several attempts have been made to exploit oil shales in the provinec.

Stony Creek field . . . This is New Brunswick's sole producing area. New Brunswick itself is the only producing area in eastern Canada, except for Ontario.

Stony Creek was opened in 1909. The discovery well was good for 500 M.c.f. of gas and several barrels of oil per day. Gravity of the oil is 37.3°. The field is located 10 miles south of the town of Moncton, and is one of the oldest producing areas in North America.

The field has a proved area of 1,830 acres. There are 43 gas wells and 17 pumping oil wells in the field. Six of these wells have both gas and oil production. The field's oil reserves as of October 1, 1950, were estimated at 479,500 bbl. Total production from 1909 to December 31, 1952, was 451,899 bbl. of crude oil, and 24,207,852 M.c.f. of gas.

Sketch of New Brunswick and surrounding continental and insular areas shows areas of pre-Carboniferous and Carboniferous sediments. Stony Creek field, extreme northeastern Canada's only producing area, is one of the oldest in North America.

Production in the field is from alternating bituminous shales and sands of the Albert formation (Mississippian). The Albert is of fresh-water origin. The gas-bearing sands at Stony Creek reach a thickness of up to 1,200 ft. The gas comes mostly from the slightly porous sand layers. This great thickness of gas sands suggests long life for the gas production in the field. Gas production amounts to about 15,000 M.c.f. per acre.

Structure . . . The field occurs on a gentle monoclinal fold on the north limb of a syncline. Apparently the accumulation of oil downdip and gas updip is controlled entirely by the decrease in porosity and permeability.

The trough in which the field lies is about 50 miles wide and 30 miles long.

Stratigraphy

The Carboniferous sediments of New Brunswick cover a triangular-shaped area of about 12,300 sq. miles . . . about half the land area of the province. The strata are bordered by metamorphics and igneous rocks on the northwest and south. These pre-Carboniferous strata range in age from Cambrian and pre-Cambrian to middle Devonian.

The northern part of the Carboniferous area in New Brunswick is underlain by Pennsylvanian sediments. These Pennsylvanian rocks are gently undulating. The Pennsylvanian beds cover an area of about 9,200 sq. miles. About 2,000 sq. miles of this area is believed to have 1,000 ft. plus of Carboniferous sediments. It is not known if favorable Mississippian strata lie beneath these Pennsylvanian formations.

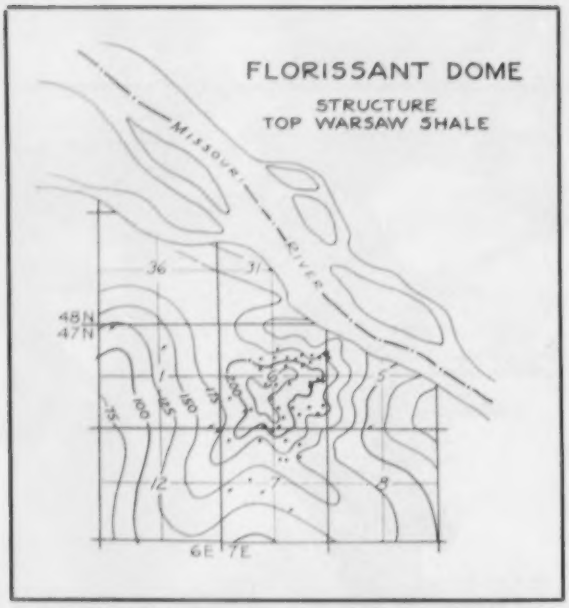
The southern part of the Carboniferous area, 3,000 sq. miles in area, consists of uplifted sections of folded and faulted Mississippian rocks overlain by Pennsylvanian strata in the eastern part. Only two of the Mississippian formations are of marine origin. The biggest part of the region's sediments are of continental origin, deposited in long trough-like depressions. The stratigraphy and structure in this region are quite complex. It is thought that at lease 20,000 ft. of Carboniferous rocks are present in parts of this area.

Outcome of Drilling

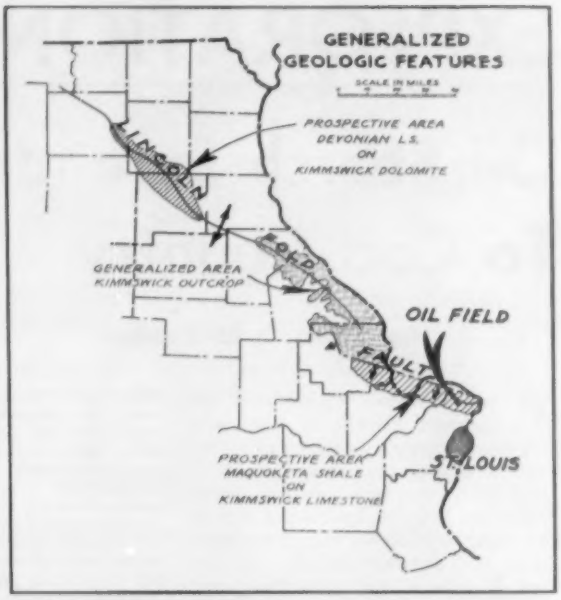
Successful completion of these New Brunswick wildcats would greatly increase the output of the province. Very little drilling activity has been undertaken in this region in many years. The basin-like area around Stony Creek has excellent possibilities for oil and gas production. The opening of a second oil field in the province would stimulate interest in this whole eastern Canada region.

Reference

Possible future petroleum provinces of North America A.A.P.G.



THE FIRST FIELD in eastern Missouri, Florissant, has been fairly well outlined by dry holes and almost entirely surrounding the producing area, Fig. 1.



THE SECOND? It may well be located in the shaded areas above that lie along a major northwest-southeast trending fold into Northeast Missouri, Fig. 3.

Northeast Missouri's Oil Possibilities Improve

by Earl McCracken

- The accidental strike that uncovered eastern Missouri's first field in 1952 extended the Illinois basin's producing area into the St. Louis suburbs.
- Now a state geologist gives the first detailed report on this field, and advances the possibility that the structure might extend over much of Northeast Missouri.
- If this possibility proves to be fact, the area's shallow pay and absence of state controls could encourage active development in the year ahead.

LACLEDE GAS CO. of St. Louis, in 1952, was in search of an underground gas-storage structure near the city of St. Louis. Since the Missouri Geological Survey had on file studies of all available shallow-water-well cuttings from this area, this information was immediately available for structural mapping.

A general reconnaissance of the wells of the area indicated two structures which might be used as a gas-storage structure, one in northern Jefferson County and the other in northern St. Louis County. The indicated structure in northern St. Louis County was chosen by Laclede as more suitable for their purposes. Additional outcrop work and core drilling in selected areas was done by Laclede to outline the structure as closely as possible.

Oil is discovered . . . Oil saturation was discovered in the top of the Kimmswick limestone at a depth of 1,029 ft. in the Laclede 3 Lange, NE NW 7-47n-7e, 4 miles northeast of Florissant. This limestone is middle Ordovician in age correlating with the Trenton of the Eastern-Interior and the Viola of the Mid-Continent. The No. 3 Lange was the first of the Laclede tests to be drilled on top of the structure and the first to drill the complete Paleozoic section. It had a reported total depth of 3,234 ft., with the top of the granite at 3,218 ft.

Since Laclede Co. was interested in a structure for gas storage only, they made little effort to develop the oil possibilities. This policy on the part of Laclede resulted in a local but very intense drilling campaign by private individuals. From the discovery in July 1953 until the middle of 1954 approximately 50 tests were drilled; 45 were completed as producers and 5 were dry. Approximately 400 acres on the structure, as outlined by drilling, were productive. The initial production of most wells was less than 20 bbl. per day. The accumulated total production as of October 1954 was approximately 75,000 bbl.

The suburban nature of the area and the lack of any legislative controls on well spacing in Missouri resulted in closely spaced wells. As a part of the completion practices, pipe was set through the Warsaw shale so as not to contaminate the fresh water found above this shale. The water below the Warsaw is generally mineralized in this area. The very porous dolomite of the Silurian is used for salt-water disposal. The development of an oil field above a proven gas-storage structure may be a unique feature of this oil-gas development, especially since an effort is being made to save the fresh water in the upper 400 ft. of the limestone.

It is not the purpose of this article to trace Laclede's development of the

Subsurface geologist, Missouri Geological Survey, Rolla, Mo.

gas-storage area. However, it may be mentioned that the 100-ft. section of St. Peter sandstone, 500 ft. below the Kimmswick oil, seems to be appropriate for gas storage.

Stratigraphy

The generalized columnar section (Fig. 2) shows the features of the stratigraphy only to the top of the Kimmswick. The upper Mississippian limestone and dolomite formations (Ste. Genevieve, St. Louis, and Spergen), 300 to 400 ft. thick, could not be zoned accurately for structural mapping except by the aid of insoluble residue studies. These beds show lithologic variations laterally and vertically which make lithologic correlations difficult.

As noted on the columnar section, most tests show dead oil staining in the upper 20 to 25 ft. of the cherty Keokuk formation. The very porous vuggy dolomite of the Silurian which produces oil in the Marine field in Illinois has no staining. The Maquoketa shale forms the caprock of the Kimmswick saturation in all tests. The Kimmswick saturation, 20 to 40 ft. thick, is found in a coarsely crystalline limestone.

Only one well, Laclede's No. 3 Lange, the discovery well, has penetrated granite in the area of the Florissant field. A tentative formational summary of footages in this well from a poor set of circulation samples while coring is as follows:

	Top	Base
Kimmswick ls.	1,029	1,125
Decorah ls. and sh.	1,125	1,150
Plattin ls.	1,150	1,325
Joachim dol.	1.325	1,445
St. Peter ss.	1,445	1,545
Cotter dol.	1,545	1,750
Jefferson City dol.	1,750	1,950
Roubidoux dol. and ss.	1,950	2,120
Gasconade dol.	2,120	2,365
Eminence-Potosi dol.	2,365	2,850?
Derby-Doerun-Davis dol. and sh.	2,850?	3,030?
Bonneterre-Lamotte dol. and ss.	3,030?	3,218
Granite	3,218	3,234 TD.

No oil staining was noted in the St. Peter (part of the Simpson) or in the Cotter (top of the Arbuckle) in this well.

Structure

The Florissant dome, approximately 10 miles north of St. Louis (Fig. 1), is a somewhat circular structure developed on a long northwest-southeast trend on the downthrown side of a fault (Fig. 3). The depth to the top of the Kimmswick ranged from 960 to 1,050 ft., depending on the position on the structure and the surface elevation. The formations show very little thinning over the structure except for the erosional truncation of the Ste. Genevieve at the top. The structure map shows a closure of 25 to 75 ft.

The original map outlining the structure was the result of the use of the intraformational zoning by residue methods of 48 shallow water wells penetrating the Ste. Genevieve, St. Louis, and Spergen formations of the Mississippian. The top of the Warsaw shale was chosen as the best datum for a structural map. Estimates of structural elevations were made from residue zones in the upper formations. Since the formations show very little thinning over the dome, any given zone could be accurately estimated to the top of the Warsaw or to any lower formation. A structure on the Warsaw would continue with depth as a St. Peter or Kimmswick structure. Previous deep wells in the general vicinity seemed to substantiate this relationship.

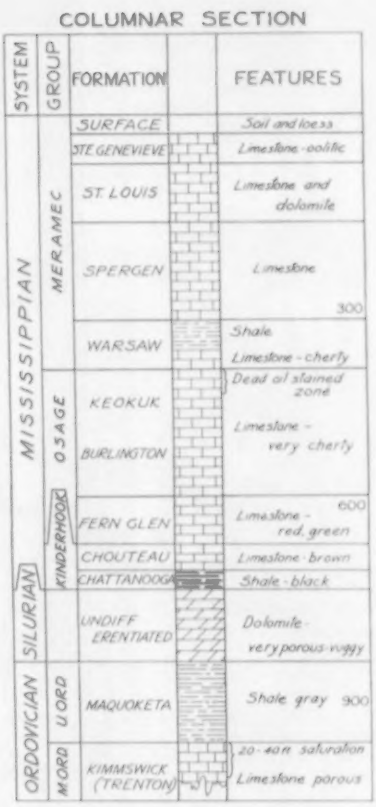


Fig. 2.

Future Exploration

The closely spaced drilling almost entirely surrounded by dry holes (Fig. 1) shows the Florissant field to be fairly well outlined.

In considering the significance of this new discovery in combination with the older Kimmswick fields of Dupo and Waterloo in Illinois southeast of St. Louis, it is almost necessary to revise our thinking of the oil possibilities in northeastern Missouri in a more favorable light.

The elements of oil accumulation common to each of these fields are as follows:

1. The reservoir rock is coarsely crystalline Kimmswick limestone.
2. Each is capped with approximately 100 ft. of impervious Maquoketa shale.
3. The structures are either small, sharp domes or short, narrow anticlines.
4. The oil accumulations are found at local reversals of dip on the sharp regional dip into the Illinois basin. The oil is considered to be trapped in these local structures during updip westward migration.

Other areas favorable . . . The shaded area on the map (Fig. 3) south of the fault has stratigraphic relationships similar to those found in the three above-mentioned producing fields. In this area, no attempt has been made to use all of the existing shallow-well information for structural purposes. Accurate stratigraphic study of the area may show other worthwhile structures. Only the Kimmswick (Viola-Trenton) is productive. The formational equivalents of the Simpson and Arbuckle penetrated in the No. 3 Lange which are on structure are not productive.

Another area with favorable structural conditions but with different stratigraphic relationships is shown along the Lincoln fold (Fig. 3). This northwest-southeast trending fold has been known as one of the major geologic features of Missouri for a long time. The general area has been drilled from time to time but the location of tests was never justified by the existing subsurface geology. Intraformational correlations in many shallow wells in the area may be used to locate local highs on this regional fold, but accurate stratigraphy is necessary to determine the structure.

On the crest of the fold, the Kimmswick is probably dolomite rather than limestone as in the Florissant area. Wells east of the fold show the Maquoketa shale thinning rapidly toward the fold. In most of the area over the fold, Devonian limestone or dolomite (upper Hunton) caps the Kimmswick dolomite. Since no tests have been drilled on structure, no conclusions can be made as to the presence of oil or oil staining in the Kimmswick or the reservoir qualities in the Simpson or the Arbuckle. In this prospective area, the Silurian vuggy dolomite is probably absent but the Hunton, capped by Chattanooga shale, is present.

These remarks on exploration are only generalized. However, the discovery of a small oil field in a normally dry state and the complete lack of legislative control has operators looking at parts of Missouri with a more favorable attitude concerning oil exploration.

DESIGNED for RUNNING

As part of the Drill String

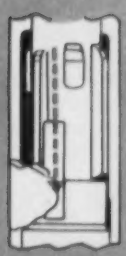
The SHAFFER-WAGGENER BUMPER SAFETY JOINT protects 2 WAYS!

Locked Position (for drilling)

Tripped Position

For safeguarding your drilling well against the hazards of a stuck drill string, nothing surpasses the *two-way* protection provided by the Shaffer-Waggener Bumper Safety Joint. Here's a tool—*specifically designed to withstand the continuous torque and vibration of running directly in the drill string*—that can be relied upon to provide sharp down-jarring at any time the drill string becomes stuck. Or, with equal ease, it provides quick release from the stuck portion for recovery of the string above the tool.

No other tool—or combination of tools—provides the ruggedness, the versatility, the simplicity, the all-around drill string protection you get in the Shaffer-Waggener Bumper Safety Joint!



TO RELEASE, *tool is tripped, moving drive keys downward.*

1 RUN THE TOOL IN THE DRILL STRING—it's specifically designed to withstand the continuous torque and vibration of modern drilling operations. The tool has been used successfully throughout the world—and at world-record depths. At all depths it provides the extra safety of double drill string protection!

2 TO USE FOR JARRING, simply slack off weight of approximately 2,000 feet of drill pipe onto the tool. This weight releases the tripping mechanism and strikes a sharp downward blow. Raising the string automatically re-sets the tool for another blow—and repeated blows can be struck as fast as the string can be raised and lowered. *It's as simple and positive as that!*

LEFT TORQUE *then rotates drive keys into unlocking slot as string is raised.*

3 TO RELEASE, in the event jarring will not loosen the stuck string, simply trip the tool and apply reverse torque as the string is slowly raised. One-sixth turn of the drive keys rotates them into an unlocking slot so that complete release is obtained by continuing to raise the string.

4 THE TOOL TRANSMITS TORQUE LOADS *in either direction through drive keys—not through threads—a big advantage over conventional safety joints.* In fact, until the definite releasing operations are performed in proper sequence, the tool *remains the strongest joint* in the drill string. Yet by first tripping the tool, it can be quickly released.

5 THE TOOL CAN BE RE-CONNECTED in the hole by simply using the recovered portion at the bottom of a fishing string for mating with the portion left on top of the fish. It's simple, quick!

Added Proof

These typical job records further show the all-around utility of the Shaffer-Waggener Bumper Safety Joint . . .

3½ MILES DEEP: On this job, the Bumper Safety Joint was released from stuck drill collars at 18,136 ft. (almost 3½ *miles* deep) requiring only 2¾ turns of reverse torque *at the table*. Recovered portion of tool was then attached to bottom of fishing string, run back into hole and connected to fish. After jarring, bit and drill collars were freed, leaving hole completely clean!

3 MILES DEEP: On another job at 16,883 ft. (over 3 *miles* deep) a Bumper Safety Joint being run in the drill string greatly simplified recovery of a parted and dropped string, again leaving hole completely clean!

SLANT HOLES—a problem with conventional safety tools—are no obstacle to the Shaffer-Waggener Bumper Safety Joint. Even directionally-drilled wells with extreme slant are handled in stride.

Send For 8 Page Descriptive Booklet **which gives full details on the Shaffer-Waggener Bumper Safety Joint—how it's built, how it operates, and how you can use it for greater safety in your drilling operations. It's free—send today!**

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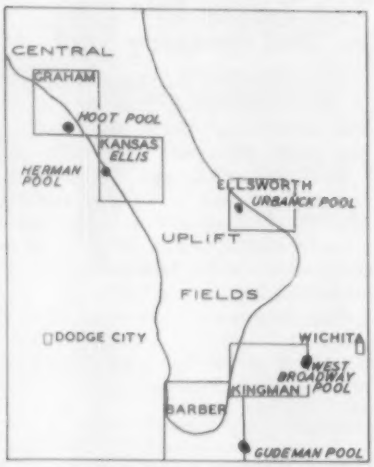
Exploration Highlights

MID-CONTINENT

KANSAS



The official completion of five new oil field discovery wells was reported in Kansas with one in each of Barber, Ellis, Ellsworth, Graham, and Kingman counties.

Nomenclature Committee Names Five New Pools

Kansas reported five new oil pools during the past week, three of them on the Central Kansas uplift, one each in the Sedgwick basin and the northern basin platform.

In Barber County, southern Kansas, Aurora Gasoline Co. and Berwick Drilling Co. 1 Gudeman, NW NW NE 10-35s-10w, completed for 593 bbl. of oil per day from the Viola lime to open Gudeman pool.

In the Sedgwick basin, Kingman County has a new oil pool at Greenland Drilling Co. 1 Viney, NE NE NW 19-28s-5w. The discovery well finaled for 127 bbl. of oil per day from the Mississippi dolomite to open West Broadway pool.

On the uplift in Ellis County, Herman pool was opened at Mallonee and O. A. Sutton 1 Herman, NW NW NE 28-13s-20w. The discovery well was completed for 199 bbl. of oil per day in the Arbuckle lime. In Ellsworth County The Texas Co. 1 Urbanek, NW NW SE 15-16s-10w, opened a new pool with completion of an Arbuckle discovery well for 231 bbl. of oil per day. In Graham County Hoof pool was opened with Lansing production at Imperial Drilling Co. 1 Hoof, NE NE SW 9-10s-23w. Completion tests rated the discovery good for 3,000 bbl. daily.

Rooks County Has a Promising Discovery Well

Petroleum, Inc. 1 Carmichael-Mosher, NE NW SW 33-8s-18w, Rooks County, is a promising new Lansing oil discovery.

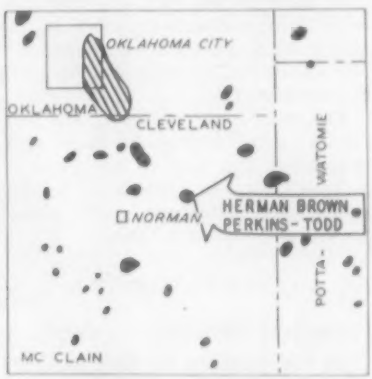
A Lansing drill-stem test at 3,137-3,200 ft. recovered 120 ft. of gas, 125 ft. of oil-cut mud, 125 ft. of heavy oil-cut mud, 120 ft. of frothy oil and 60 ft. of clean oil. Recovery on another test at 3,230-68 ft. was 2,175 ft. of clean oil.

OKLAHOMA

More Pay Sand Tested at Cleveland County Strike

Herman Brown has taken another test of 10 additional ft. of second Wilcox sand at 1 Perkins-Todd, SE SW NW 21-9n-1w.

The Cleveland County discovery cored from 7,146-56 ft., recovering 10 ft. of oil-saturated sand. Recovery on a drill-stem test at 7,146-56 ft. was 875 ft. of heavy black oil.



Another 10-ft. section of second Wilcox sand has been tested at a Cleveland County discovery, northeast of Norman in 21-9n-1w.

A test made previously at 7,111-26 ft. got 6,300 ft. of oil on 1-hour opening. On 3-hour test at 7,111-36 ft. the wildcat flowed oil in 45 minutes at 16 bbl. hourly through ¼-in. surface choke. A 20-minute test at 7,137-46 ft. got 4,800 ft. of oil. The wildcat is located on a seismic prospect.

Northwest Purdy Field Has Its Second Well Indicated

Sinclair Oil & Gas Co. et al have an indicated producing well for Northwest Purdy field, Garvin County, after recovering commercial oil from the Hart sand at the 1 Cantrell, C SW NE 15-3n-4w.

Recovery on a drill-stem test (1 hour) at 8,918-63 ft. was 1,350 ft. of 39°-gravity oil and 180 ft. of heavily oil and gas-cut mud. Drilling continues.

The discovery well in the field was the 1 Community Shelton, C NE SW 15-3n-4w. This well was completed for 104 bbl. in 10 hours on ¼-in. choke through perforations at 8,903-34 ft. The wildcat was taken down into the Springer sand at 12,095 ft.

Grady County Springer Discovery Completed

Sinclair has completed a deep Cunningham (Springer) discovery in Grady County for a flow of 313 bbl. of 50.2°-gravity oil in 24 hours through 9/64-in. to 23/64-in. chokes.

The 1 McClintock, NE SW SE 8-5n-5w, was perforated at 11,717-85 ft. Average gas volume was 8,091 M.c.f. per day. Gas-oil ration was 25,883:1. Eighty-acre spacing has been asked for section 7, 8, 9, and N½ 16, N½ 17, and N½ 18-5n-5w.

McLish to Be Perforated at Sinclair 1 Griffin in Marshall

Sinclair et al will perforate the McLish at 1 Griffin, SE NE NE 16-5s-5e, multipay discovery north of the city of Madill in Marshall County, southern Oklahoma.

A final drill-stem test was made in the Oil Creek sand at 7,509 to 7,636 ft. Gas surfaced in 5 minutes at 2,996 M.c.f. per day. The well flowed 3.9 bbl. of distillate per hour. Gas-oil ration was 31,200:1. Plug has been set at 7,209 ft.

Northwest Chitwood Pool Confirmed in Grady

The second producer for Northwest Chitwood field in Grady County has been indicated at Magnolia Petroleum Co. 1 Johnson, C NW NW 19-5n-6w. It is the south offset to the discovery well of the field.

The operator recovered oil from the Deese sand at 9,837 to 9,907 ft. Recovery was 900 ft. of 39°-gravity oil and 300 ft. of oil-cut mud. The well will dig deeper.

Multipay Discovery on Madill Anticline Finaled in McLish

Sinclair Oil & Gas Co. et al have completed the highly-significant Madill-Aylesworth anticline discovery in Marshall County, southern Oklahoma.

The 1 Griffin, SE NE NE 16-5s-5e, multi-pay discovery, 2 miles north of Madill, perforated casing opposite the basal McLish at 6,587-6,635 ft. with 192 holes. The well flowed 810 bbl. of oil, natural in 14 hours through a ¾-in. choke. Gas volume was 1,255 M.c.f.

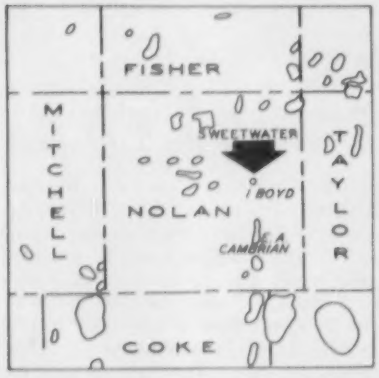
per day with gas-oil ratio 903:1. Gravity of the oil is 37.3°. The state allowable for the well is 55 bbl. per day.

The wildcat reached a total depth of 7,636 ft. in the Oil Creek sand. The well found nine other pay zones, eight of them behind the pipe and the ninth is in open hole. The indicated pays ranged from the Springer to the Oil Creek.

NORTH TEXAS

Nolan County Discovery Makes High Flow of Oil

Hunt Oil Co. has released completion data on its 1 C. E. Boyd, Ellenburger discovery 4 miles northwest of Nolan townsite in Nolan County. In



Hunt Oil Co. 1 Boyd, Ordovician discovery northwest of Nolan.

10 hours of testing through 20/64-in. choke, the well tanked 280 bbl. of 43.5° oil. Flowing tubing pressure was 380 psi. Pay section was perforated between 6,590-6,625 ft. Field sources called the pay Ellenburger but it had not been confirmed by the operators at this writing.

HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Hamilton County Prospect Reported More Oil Shows

Hamilton County may have its first oil production at a remote wildcat being drilled by United Producing Co.

The 1 Helfrick, SE SE 6-25s-42w, 12 miles southwest of Syracuse and about 20 miles northwest of Hugoton field Permian gas production, recovered additional oil shows on further drill-stem tests. Previously the wildcat had hinted production in a sand comparable to the Keyes-Penn sand of the Oklahoma Panhandle. The wildcat prospect is located 4½ miles east of the Colorado state line.

OKLAHOMA PANHANDLE

Camrick Field in Texas Has Second Pay Indicated

Texas County's big Camrick-Penn field has its second pay zone indicated at American Gas Producing Co. 1 Johnson "E," SW SW NE 19-1n-19eCM, 1 mile southwest of nearest producers in the growing field.

The well flowed gas on drill-stem test at 4,635-44 ft. The formation has been identified tentatively as the Lansing, one of Kansas' biggest producing zones. Regular field pay is the Morrow.

Cities Service Oil Co. has begun operations on two offsets to the prospective Lansing strike.

Beaver County Has New Gas-Distillate Discovery

Beaver County in the Oklahoma Panhandle is staging a rapid comeback since its active year in 1952. The latest in recent gas-distillate strikes in the area is O. H. Parker's 1 Hennigh, NW NW 28-6n-28eCM, about 7 miles north of Gate City, Okla.

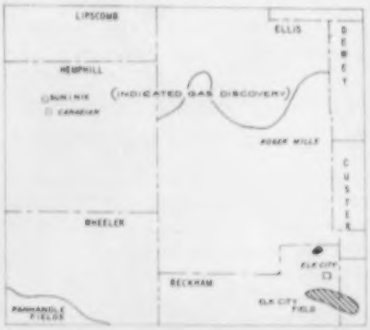
This wildcat got its production indications in the Morrow sand on drill-stem test. The well is 3½ miles of J. Tom Grimmett 1 Hennigh, a 1953 gas-distillate discovery that opened Southeast Greenwood field.

TEXAS PANHANDLE

Hemphill Remote Wildcat Due for Testing in Des Moines

Sun Oil Co. has run casing at a remote wildcat in Hemphill County, Texas. The 1 Dale Nix, Section 81, Block 42, H&TC Survey, is located 2½ miles northwest of the city of Canadian.

The wildcat is at total depth of 9,797 ft. The well kicked gas at 9,760-69 ft. ft. in an arkosic sand of the lower Des Moines (Pennsylvanian) series. Circulation was partially lost up the hole above the gas pay zone. The commercial prospects of the well are undetermined at last report due to poor cores and drill-stem tests.



Casing has been run for possible testing of gas shows at a rank wildcat in Hemphill County, Texas Panhandle.

The 1 Nix is located about 23 miles southeast of Lips Ranch field and 65 miles northwest of famous Elk City field in Oklahoma.

Twin Morrow Field Has Its Third Producing Well

The third well has been completed in new Twin Morrow field, one of the best fields in the current Pennsylvanian play in the Panhandle area.

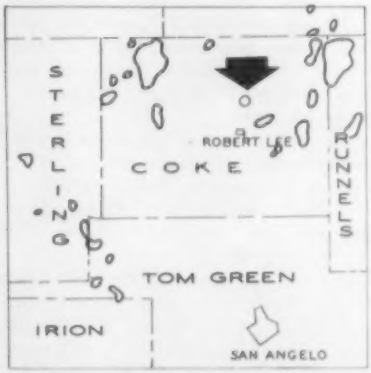
R. H. Fulton 3 Lasater, 5 miles northeast of Spearman, was potentialed for 294 bbl. of oil per day on ¾-in. choke. Gravity is 40.2°. Production is from perforations in the Morrow-Penn sand at 7,195-7,205 ft., natural.

The 2 Lasater, completed a few weeks ago, was the biggest well yet completed in the Anadarko basin area of the Texas Panhandle. It finaled for 1,296 bbl. per day.

WEST TEXAS-NEW MEXICO

WEST CENTRAL TEXAS

Coke County Canyon Discovery Finaled



J. B. Randle 1 Wojtek, Canyon sand discovery north of Robert Lee. Offsets have been started by Randle and Union Oil Co. of California.

Central Coke County gained a Canyon sand oil pool at J. B. Randle 1 F. C. Wojtek, northwest of the town of Robert Lee. Nearest production is to the east in McCutchen field.

The discovery produced 304 bbl. of 43° oil a day through 10/64-in. choke, with gas-oil ratio of 431 and flowing tubing pressure of 200 psi. Pay was perforated between 4,913-31, 4,940-46 and 4,950-56 ft.

Tom Green County . . . Chambers & Kennedy and El Capitan Oil Co. 1

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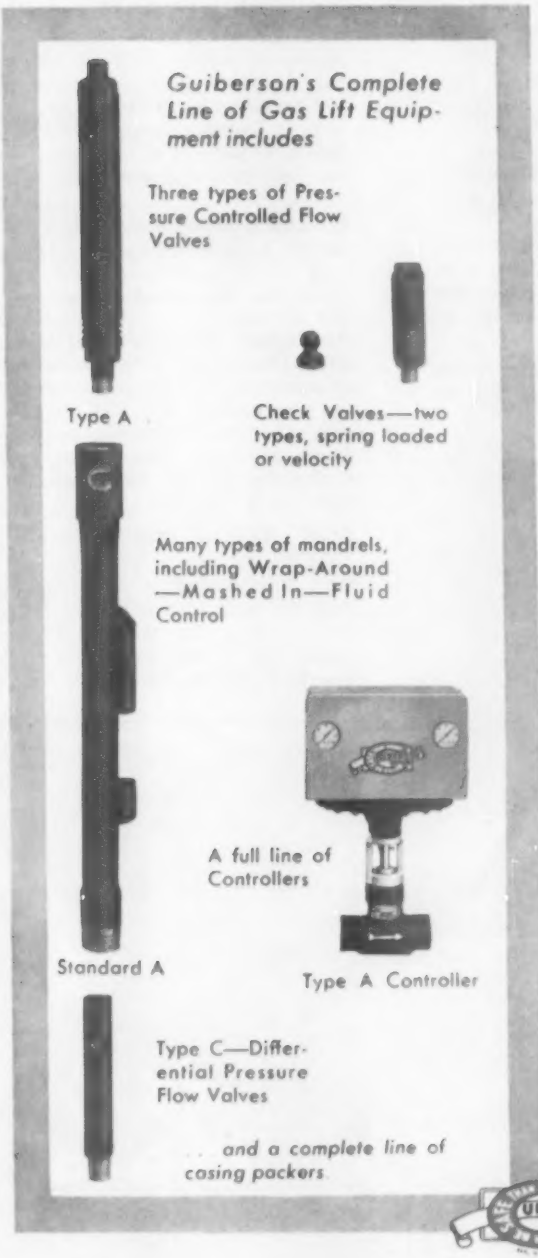
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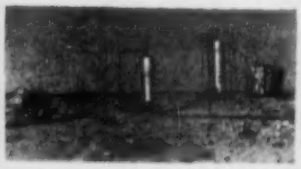

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Willis Johnson, 1 mile south of Christoval, has been completed as a pumping discovery from Strawn lime. The well pumped 61 bbl. of oil a day from pay at 5,254-58 ft.

ARK-LA-TEX

ARKANSAS

Gas Tested in Tuscaloosa In Union County Well

Spartan Drilling Co. is taking potential to evaluate 1 Jerry, C SW SE SE 29-17s-14w, Tuscaloosa discovery ½ mile north of Nick Springs in Union County.

The well has an estimated open flow of 9,000 M.c.f. of dry gas per day. Perforations are at 3,085-87 ft.

NORTH LOUISIANA

New Wilcox Sand Oil Pool for Catahoula

Catahoula Parish in east-central Louisiana has a new Wilcox oil pool assured at E. C. Wentworth 1 Beltzhoover et al, C SW NW 8-5n-6e.

The new field is 1¼ miles southwest of Serena. Nearest production is Larto Lake field, 1⅛ miles southwest. The well flowed at the rate of 173 bbl. of oil per day on 3/16-in. tubing choke from perforations at 5,716-19 ft. in the Wilcox.

Manistee Field Opened In Grant Parish Area

A new Sparta discovery well was completed in Grant Parish, opening Manistee field.

The discovery well is Clay Oil & Gas Corp. 1 Urania Lumber Co., 24-7n-1e. The well gave up 31 bbl. of oil on potential pump test through perforations at 1,813-17 ft. Gravity of the oil is 18 degrees.

Winn Parish Field Has Completed Development

Crossroads field development has been finaled for the present. The Winn Parish Wilcox pool, central Louisiana, was opened early in 1954 at R. T. Jameson and Associates 1 Urania Lumber Co., 5-10n-1e. It produced from the Wilcox sand through open hole at 1,480-86 ft. It pumped 20 bbl. of oil per day.

The field recorded six more oil wells after discovery. More development may be planned for 1955.

EAST TEXAS

Deep Test Planned For Neches Field

Humble Oil & Refining Co. has scheduled a 12,000-ft. wildcat in the Neches Woodbine field of Cherokee and Anderson counties. The operation will be drilled as 13 Harry Lee Carter, in P. O. Lumpkin Survey, A-512, which falls in or just east of the Neches River bed, in Cherokee County.

Trans-Tex Drilling Co., Longview, has filed application to drill a 4,500-ft. wildcat 4 miles northwest of Jacksonville, in Cherokee County. Location is in the Jose Pineda Survey, A-40.

Rusk County gas discovery . . . Carter-Jones Drilling Co. 1 Adams, extension or discovery west of Carthage field, has been completed for 116,000 M.c.f., plus 35 bbl. of distillate per 1,000 M.c.f. Flowing pressures were not disclosed. Pay was the Pettit limestone at 6,817-23 ft.

South Malakoff field extended . . . Thos. D. Humphrey & Sons 1 Sheppard, 1 mile north of present production, has been completed for 168 bbl. of 42° oil a day through 20/64-in. choke. Gas-oil ratio was 1,200:1. Pay was the Bacon limestone at 7,658-66 ft.

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Wood County . . . Stanolind Oil & Gas Co. was reported planning on drilling its 1 Peveto, 2 miles southwest of Yantis, to 13,500 ft. The well was originally drilled to 8,405 ft. in 1951, and currently is drilling below 8,911 ft. on the deepening operation.

GULF COAST

SOUTHWEST TEXAS

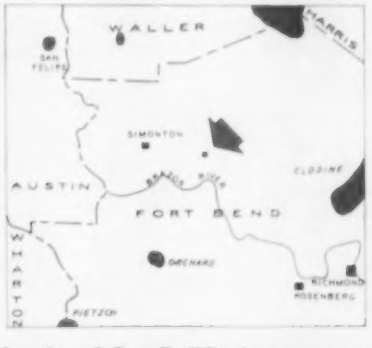
Seventh Sand Produces In Mills Bennett Field

Another pay zone, the seventh, has been opened for production in Mills Bennett field, 12 miles southwest of Falfurrias, in northwestern Brooks County. Its initial well, Mills Bennett Estate 13 Fee, is completed with perforations at 3,992-4,000 ft. Flow through X-29 choke is 99.57 bbl. of 42°-gravity oil daily with pressure of 750 psi. and gas-oil ratio of 435 cu. ft. per barrel. The field, opened in April 1953, now has 12 producing wells. Only two dry holes have been drilled. Discovery well produces from sand at 4,675-87 ft.

TEXAS GULF COAST

Fort Bend County Wildcat Produces Gas-Condensate

A new gas-condensate field has been opened in northwestern Fort Bend County. Discovery well, drilled by Sam E. Wilson, Jr., of Corpus Christi, is located in the John Randon Survey, 3 miles southwest of Fulshear, and



Location of Sam E. Wilson's new gas-condensate discovery well in northwest Fort Bend County.

about 15 miles northwest of Rosenberg. It is about 6 miles northeast of Orchard dome (Moore's field), and about 7 miles southwest of Fulshear field.

The well was drilled to 8,617 ft., and has production string to 8,470 ft. Producing interval is at 8,388-98 ft., open through casing perforations. It is rated good for 13,500,000 cu. ft. of gas daily, calculated open-flow potential. Gas-condensate ratio is 62,500 cu. ft. per barrel. Shut-in pressure gages 3,102 psi.

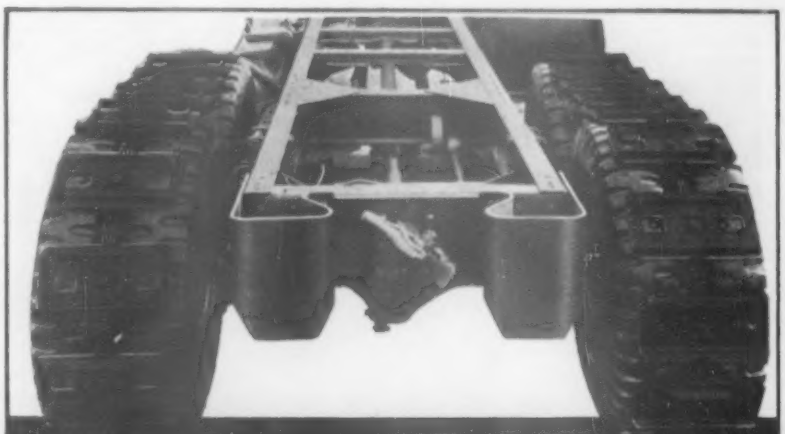
Second Producer Proves New Yonojosa Oil Strike

W. P. Luse and J. B. McAdams, of Dallas, have confirmed their recent Yegua oil-discovery east of the Nona Mills area, 5 miles south of Kountze, in Hardin County.

Their second test, 1 Hooks, 2,000 ft. west of their Turner discovery producer, flowed 141.85 bbl. of 36.4°-gravity oil per day through 7/64-in. choke. Pressure was 1,295 psi. and gas-oil ratio 685 cu. ft. per barrel. It appears to be a better producer than the discovery well, which flowed only 57 bbl. per day.

Pay interval in the confirmation well is 8,026-30 ft.; that of the discovery well is 8,032-34 ft.

In the meantime, Humble Oil & Refining Co. has entered the new area, designated as Yonojosa field, and is starting an east offset to the discovery



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well. Its operation is 1 East Texas Oil Co. Fee "I," projected to 10,500 ft.

West Extension Confirmed By New South Mayes Well

McCarthy Oil & Gas Corp. has completed its second well in the new west extension area of South Mayes field, in Chamber County. It moves the area's gas-condensate production a location further west and opens what is indicated to be a new pay zone.

The well, 2 Frankland et al, perforated in sand interval at 11,718-40 ft., flowed 144.52 bbl. of condensate with 1,515,000 cu. ft. of gas per day through 9/64-in. choke under pressure of 4,115 psi.

The extension area's discovery well, 1 Frankland et al, completed last April, produces gas and condensate from a deeper sand at 12,283-95 ft.

Two Rigs Will Operate in Newly Opened Algoa Field

Superior Oil Co. soon will have two rigs running in the new Algoa area, Galveston County, following the recent completion of its second well.

The latter well, 1-A Cooper Unit, completed in sand at 9,538-41 ft., opened the area's first oil production.

Location of Superior Oil Co.'s new Algoa field. Arrow points to newly completed oil producer, northwest of gas-condensate discovery well.

It is 2,300 ft. northwest of the discovery well, 1 Cooper, completed in October with gas-condensate production from sand at 11,659-65 ft.

The rig used on these two wells already is working on another location, 1 Crooker, approximately 1,100 ft. east of the new oil producer. An additional rig is being moved for an outpost test, 1 Light, located ¾ mile northeast of the gas-condensate discovery well. Both are projected to 13,000 ft.

Potential gage of the oil producer was 145.11 bbl. per day with flow through 7/64-in. choke under pressure of 1,360 psi. Gas-oil ratio was 779 cu. ft. per barrel.

The area is 1 mile north of Algoa, near the Galveston-Brazoria county line.

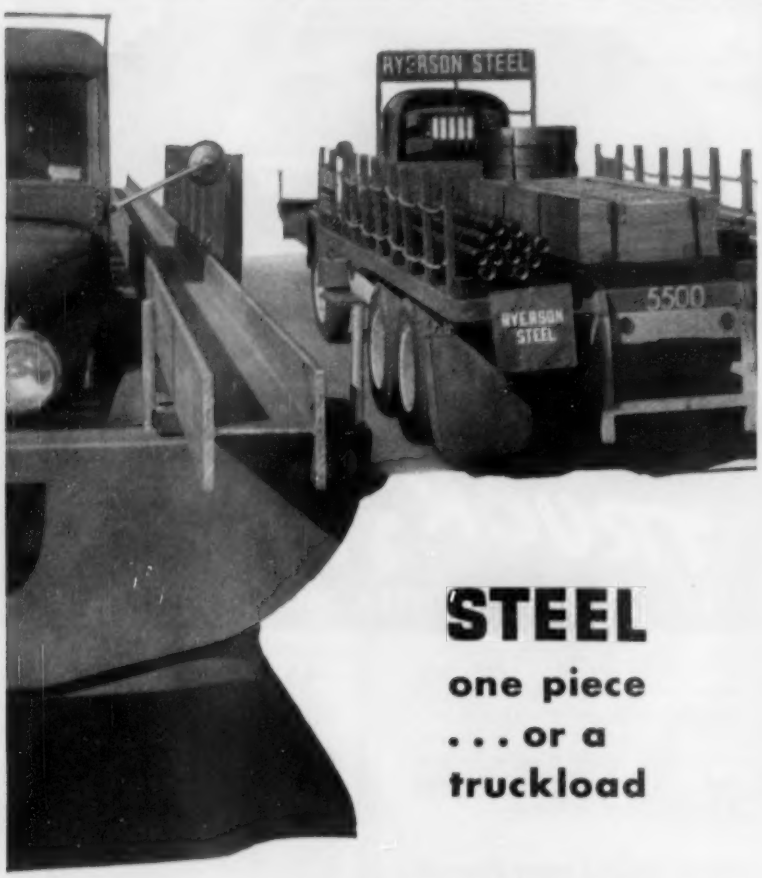
SOUTH LOUISIANA

East White Lake Field Gets Deeper Production

A new oil-productive sand, 400 ft. deeper than the previous deepest pay in the field, has been uncovered at East White Lake, in Vermilion Parish. The new pay, perforated at 7,142-46 ft., is in Union Oil Co.'s 23-A Vermilion Parish School Board, completed with flow rate of 146 bbl. of 27° -gravity oil per day through 8/64-in. choke. Flow pressure gaged 710 psi., and gas-oil ratio 295 cu. ft. per barrel. Other productive sands range in depth from 5,900 to 6,700 ft.

Shallower Pay Opened

Superior Oil Co. is opening a 9,100-ft. gas-condensate reservoir on the west side of Kent Bayou field, in Terrebonne Parish. Other wells in the field produce from sands below 11,000 ft. Superior's new "shallow" pay is in its 3-A Continental, perforated at 9,126-35 ft. The well flowed an ungaged volume of gas, spraying con-



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densate, while cleaning through 24/64-in. choke, and has been shut in for potential tests. Flowing pressure was 2,975 psi.

Extension Well Uncovers Crescent Farms Deep Pay

Gas-condensate production in the Crescent Farms area, northwest of Hollywood field, at Houma, in Terrebonne Parish, is being extended approximately 1¾ miles to the northeast with a deeper-pay discovery well being completed by Arkansas Fuel Oil Co.

The new well, 2 Southdown Sugars, is estimated good for 100,000,000 cu. ft. of gas daily on open flow. It flowed 2,418,000 cu. ft. daily, spraying condensate, through 9/64-in. choke on a pre-pontential test.

Pay is in the lower Krumbhaar sand with perforations at 12,519-22 ft. This pay is approximately 1,200 ft. below the Realty sand from which the area's other three wells have been completed. Discovery well, 2 Southdown Sugars Unit 1, was completed last March.

Lake Long Limits Extended

Production in the old Lake Long field, in Lafourche Parish, is being extended ½ mile to the north with completion by Texas Gulf Producing Co. and Pan American Production Co. of their 17 State-Lake Long as a gas-condensate well in sand at 9,822-34 ft. The well's flow through 18/64-in. choke was at the rate of 4,476,000 cu. ft. of gas with 61 bbl. of condensate daily. Pressure was 3,000 psi. Hole was drilled to 11,519 ft.

Plumb Bob Field Spreads

Southern Natural Gas Co. has a new oil well located south of production at Plumb Bob, in St. Martin Parish. Its 1 St. Martin Unit 1, in 28-8s-7e, testing perforations at 10,230-50 ft., flowed at the rate of 200 bbl. daily through 10/64-in. choke. Total depth is 10,744 ft. It is 2,000 ft. from nearest production.

EASTERN INTERIOR

ILLINOIS

In Gallatin County, 5 miles south of New Haven, Eakle & Holder 1 Westphilinger heirs, SW SE SW 12-8s-9e, has set casing. Recovery on a drill-stem test in the Cypress sand at 2,496-2,507 ft. was 360 ft. of gas, 340 ft. clean oil, and 35 ft. mud-cut oil with no water. This is a step-out discovery.

● In Saline County near Eldorado W. C. McBride 1 Flanders, SW NE SE 10-8s-7e, completed for an initial flow gage of 1,140 bbl. per day from perforations in the Waltersburg sand at 2,114-40 ft. Roy Pledge and H. E. Walton 1 Clark Comm., SW SE NE 20-8s-7e, had an initial potential of 1,200 bbl. of oil daily from the Waltersburg sand at 2,130-42 ft. Saline County has 23 active operations, making it one of the state's most active areas.

● In Gallatin County O. W. Mayhew and Associates 2 Clarence Mills, NE SW SW 4-8s-9e, 4 miles southeast of Omaha, Ill., tested in the Aux Vases at 2,921-35 ft. to get 510 ft. gas, 90 ft. oil and gas-cut mud with no water. This wildcat prospect is 3 miles from other production. If fracturing is a success the well might open a whole new producing area.

● In Marion County, 11 miles east of Salem, Webster-Perrine-Baldridge have a new area under development 1 mile north of Iuka pool.

The 1 Blackburn, SE SW SE 3-2n-4e, finaled for 220 bbl. of oil per day from the St. Louis lime at 2,773-84 ft. The 1 Laymon, NW NE NE 10-2n-4e, is pumping and flowing 350 bbl. of oil daily from the St. Louis zone.

Shallow well production of less than 2,000 ft. in depth has been established in the Aux Vases formation in Moultrie County, Illinois, by Pure Oil Co.

The discovery well is the 1 Wagner Consolidated which has been completed as a pumping well for an initial production of 123 bbl. The well is in Section 22, 12N, 6E, Moultrie County, and is about 8 miles west of Mattoon. It has been shut in awaiting the erection of additional tanks.

The well made a test of the Devonian from 3,290 to 3,315 ft. where it produced 29 bbl. of oil and 15 bbl. of salt water. It was plugged back to the Aux Vases where perforations were made from 1,962 to 1,984 ft.

GREAT LAKES

EASTERN CANADA

Lake Erie . . . A license to explore 600 acres under Lake Erie for oil and gas has been granted by the Ontario Government to Mrs. Gertrude Springsteen of Windsor. The acreage is offshore from the Springsteen property, west of Morpeth Dock, in Howard Township, Kent County, another license is effective for three years from December 1, 1954, and provides that if oil or gas are discovered, the Springsteen interests may apply for a 21-year lease, subject to annual rental of $340 or 50 cents an acre. The province would receive a royalty of 2 cents per 1,000 cu. ft. on gas and 10 per cent of all petroleum or petroleum products.

On November 26 a similar license was granted Dominion Natural Gas Co. for 1,190 acres in front of its properties in Aldborough Township, Elgin County.

APPALACHIAN

PENNSYLVANIA

In Banks Township, Indiana County, Southwest Pennsylvania, Keta Oil & Gas Co. and Columbian Carbon Co. 1802 Farmers & Miners Trust Co., rank wildcat was Hydrafraced and the gas now tests 400,000 cu. ft., chert 7,488 ft., Oriskany sand 7,564 ft., depth of hole 7,586 ft.

WEST VIRGINIA

In Walker district, Wood County, West Virginia Hope Natural Gas Co. 9634 deep wildcat is still casing and is now at a depth of 11,637 ft. In Huntersville district, Pocahontas County, United Fuel Gas Co. 8176 S. M. Chapman, rank wildcat is running the 7-in. casing at 3,308 ft.

OHIO

W. C. Adair and Co. completed a very good producer on 2 David Funk, Section 12, Washington Township, Hocking County. Clinton sand was found at 2,830-2,863 ft. with 20 bbl. natural, which increased to 400 bbl. with 700,000 cu. ft. gas after fracturing.

● Preston Oil 1 George Ice, Section 5, Hopewell Township, Perry County, the third well in new Glenford pool, made 118 bbl. in a 24-hour test after fracturing sand, logged at 2,734-56 ft.

● A ⅓-mile step-out in the northeast part of Hopewell Township, Licking County, was good for 93 bbl. after fracturing. Wray Drilling 1 Carl Fisher, Section 10, found the Clinton at 3,067-3,108 ft.

EASTERN KENTUCKY

United Fuel Gas Co. has a dry hole at their 9 Fordson Coal Co. wildcat located on Upper Dezarn Branch in Clay County. Operators had Devonian black shale from 2,505 to 2,745 ft., Corniferous from 2,751 to 2,833 ft. with a show of gas from 2,771-74 ft. Stratafrac failed to increase flow and well has been abandoned at a total depth of 2,850 ft.

In Southern Lawrence County and in the old Bolts Fork Pool area, S. H. Keesey is testing Berea sand at a total depth of 1,848 ft. Berea (Mississippian) topped at 1,760 ft. had light showings in several zones and operator may shoot well to increase production. Test is located on the Phil Preece lease.

PACIFIC COAST

CALIFORNIA

New Tejon-Grapevine Pool More Nearly Defined

Failure of several recent stepouts to the Olcese pool discovered by Reserve Oil & Gas Co. at Tejon-Grapevine, southeast San Joaquin Valley, is giving a better idea of the pool's productive limits. Future developments may change the picture but it seems likely the pool will be about 400 acres in extent.

In NE NE 27-11n-19w, ½ mile northeast of production, Reserve 72-27 Reserve was abandoned at 6,084 ft. after finding the Olcese wet. The company's "66" well, an east offset to the northernmost producer, likewise found the sand wet. It was plugged back to 4,210 ft. for redrilling after reaching a depth of 5,875 ft.

Subsequent to these two developments a test ½ mile northeast of production was a failure. About 1 mile west of the 15-well pool, Drilling & Production Co. 33 J.V. failed in the 5,700-ft. Olcese but discovered a 7,000-ft. Jewett sand where it was completed as a 500-bbl. producer. Faulting is believed to limit production along the southeast flank.

Dagany Gap Gas Find

The Dagany Gap area of extreme northern Kern County, scene of several shallow oil discoveries in the past 18 months, yielded a good gas discovery. Gilliland Oil Co. 3 West, in SE SW 3-25s-18e, was completed flowing 2,250 M.c.f. daily through a ¼-in. choke with a flowing pressure of 435 psi. Production was through perforations at 1,198-1,308 ft.

San Clemente Test Dry

The Texas Co. abandoned its west offset to the discovery it recorded near San Clemente last March. When completed early in October the well produced 51 bbl. of 33°-gravity oil daily, along with a 64 per cent water cut. The oil volume since declined to where the well no longer was commercial. Located in SW NE 22-8s-7w, 1 O'Neill Estate-2 was produced from Eocene or Cretaceous formations at a plugged back depth of 5,845 ft.

Beverly Test Going Deeper

Universal Consolidated Oil Co. continued drilling at its fourth Beverly Hills well after encountering the regular Miocene objective at about 7,000 ft. Drilling from an island on 20th Century-Fox Studio properties, the well was nearing the 7,700-ft. mark at last report.

Because of lack of a pipeline outlet none of the three completed wells have been placed on production. Plans for a line to the nearby Baldwin Hills field are nearing completion.

Pipe Set in Glenn Test

Humble Oil & Refining Co. ran a protective string of 9⅝-in. casing to almost 12,480 ft., after successfully recovering a fish from that depth, in its Glenn County test. Located in 16-20s-3w, 4 miles west of Willow gas field, the test has established a new depth record for the northern counties gas area. The 498,000-lb. string, set at 12,470 ft. with 550 sacks, is believed to be the longest 9⅝-in. string ever run in a California well.

WESTERN CANADA

ALBERTA

Three New Discoveries Recorded in Province

Four wells in western Canada showed indications of discovery last week. Alberta accounted for three of these in

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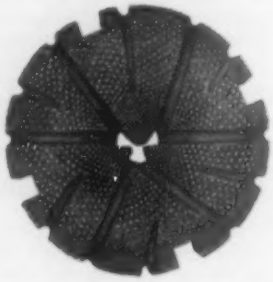

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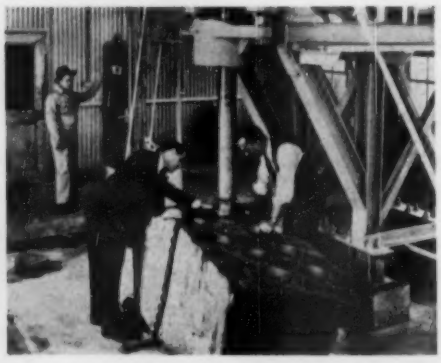

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the Morningside, Alhambra, and Willingdon districts; while Saskatchewan added the other in the Steelman area of that province.

Alhambra . . . The most encouraging find in Alberta was at the Alhambra well, being drilled by Texaco Exploration Co. and McColl Frontenac Oil Co., Ltd., on a 87,680-acre tract of reservation lands, purchased earlier this year for a cash bonus of $2,100,125.

The discovery well is Texaco A-2-1 Alhambra, LSD 2, 1-42-6w5, 14½ miles southeast of Rocky Mountain House Cardium sand oil wells. The Cardium sand was entered at 6,097 ft. and then the well plugged back to 7,805 ft. after being taken down to 8,738 ft. total depth. Perforations were at 6,099 to 6,111 ft. After fracturing the well flowed at the rate of 22 bbl. hourly on ¼-in. choke on 3-hour flow. Then the well yielded at the average rate of 5 bbl. hourly on later tests of 2 days duration through chokes varying from 12/64-in. to 20/64-in. The well is continuing to flow test.

SASKATCHEWAN

Charles Discovery Hinted At Steelman Area Test

Saskatchewan's lone well to indicate discovery is being drilled by Imperial Oil, Ltd. It is located about 60 miles southeast of Weyburn and 18 miles northeast of Estevan.

The new discovery prospect found 34°-gravity oil in the Charles member of the Mississippian. And an initial drill-stem test in the Mission Canyon yielded oil showings in the form of oil-cut mud. The well, Imperial 1-8 Browning, LSD 1, 8-4-5w2, entered the Charles at 4,670 ft. There were four drill-stem tests run all giving oil recoveries, ranging from 280 ft. of clean oil to 90 ft. of oil-cut mud. Recovery in the Mission Canyon was 150 ft. oil-flecked mud.

MICHIGAN

New Traverse Discovery Going Under Tests

A new Traverse oil discovery for Michigan was under test, following acidization, at the E. Edwin Brehm 1 Jeppesen, NW SE NE 3-11n-7w, Douglas Township wildcat, Montcalm County.

On an 8-hour flow test the day following acid treatment, well flowed 52 bbl. of oil (after being kicked off with swab). Following a 2-hour shut-in, during which time casing pressure built

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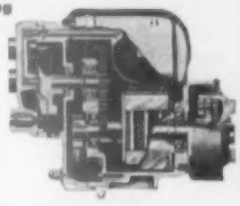

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from 260 psi. to 360 psi., well was opened for 20 minutes and flowed an additional 8 bbl. of oil. All of this production was net. Well flowed back all acidizing fluids and 11 bbl. of net oil immediately following acidization previous day. Further production tests were being run.

Wildcat, located on a 1,078-acre block farmed by Brehm, Arthur Scribner and Ray Whyte from W. H. Strickler, W. R. Swetland and Jack Mortensen, is located about 4 miles north of Stanton Traverse oil pool, and just over a mile west of Douglas Dundee oil pool both in the same township. Top of Alpena Traverse was logged at 2,995 ft. Pay showed from 3,025-34 ft. Hole carried about 800 ft. of free oil natural in 17 hours. Bottom of hole was reported at 3,045 ft., plugged back to 3,038 ft. Plugback was reported to have effectively shut off any bottom-hole water that showed.

ROCKY MOUNTAIN

NEBRASKA

Kimball County Discovery Tested

Skelly Oil Co. has opened an apparent new pool 3 miles east of Long field in Kimball County. Test of "D" sand at 1 Phillips, SE SE NW 8-12n-54w recovered 2,430 ft. of oil and 960 ft. of water in 1 hour. Test was of the zone 5,989-94 ft. Flowing pressure was 80-735 psi. The operator was last reported coring in "J" sand below 6,102 ft.

UTAH

Second Chapita Wells Unit Test Successful

Continental Oil Co. reported a flow of gas at the rate of 3,000-5,000 M.c.f. per day on test of 2 Unit, NE NW SE 28-9s-23e, in the Chapita Wells unit, Uintah County. The well is the second drilled in the unit and is more than 1 mile south of the 1952 discovery which was completed for 62 bbl. of oil with more than 1 quarter million cu. ft. of gas per day. Test in the confirmation well was of the interval 8,155-8,220 ft. Tool was open for 4¼ hours, with gas at the surface after 2 minutes. At last report the operator was pulling tool.

New Oil Recovered at Grand County Wildcat

Delhi Oil Corp. recovered 4,230 ft. of oil with 560 ft. of heavily oil and gas-cut mud at 2 Utah, SW NW SW 18-25s-21e, Grand County. Test was of the interval 7,646-72 ft. Tool was open 11 hours, and flowing pressure was 190-1,210 psi. The operator has acidized and is continuing to test. The reported recovery was on test without treatment. The well recovered oil on drill-stem test of Pennsylvanian several weeks ago and has been testing since that time.

COLORADO

Arapahoe County Wildcat Recovers Show of Oil

Sinclair Oil & Gas Co. recovered oil on test of a wildcat in Arapahoe County, west and south of major production through the Denver-Julesburg basin in Colorado. The well is 1 Barney, NE NE NE 32-5s-61w. Test was open for 1 hour, 50 minutes in the interval 6,951-59 ft. There was gas in 5 minutes at a rate of 900,000 cu. ft. per day. Pipe recovery was 330 ft. of oil and 70 ft. of oil and gas-cut water. Flowing pressure reached 500 psi. at the end of the test. The operator has reported no tops and is coring below 6,981 ft. The well is north of Sinclair's apparent discovery in Elbert County at 1 Bradbury, NE NE NE 28-6s-61w.

A new oil discovery 4 miles northeast of Akron, Colo., is the latest of several wildcats to move limits of Denver-Julesburg basin production eastward through Washington County.

Akron Area Wildcat Finds Oil

Wytex Service Corp. and Jack Ladmer tested 1,470 ft. of oil, 120 ft. of heavily oil-cut mud and 120 ft. of slightly oil-cut water at 1 Daniels, C SE SW 25-3n-52w, in the Akron area of Washington County. Test was in the "D" sand interval 4,519½-53 ft. Tool was open for 2 hours, 40 minutes. The well is 4 miles northeast of the town of Akron. It is well east of established production in this portion of the Denver Julesburg basin, some 15 miles east of Buffalo. There has been only scattered drilling in the vicinity.

Flow Reported at Washington County Wildcat

Kingwood Oil Co. reported a flow of 26 bbl. of oil per hour on ½-in. choke at 2 Snyder, C SW SE 2-2n-54w, Washington County. Test was of perforations at 4,808-14 ft., with top of "J" sand called at 4,798 ft. The well is the second in the immediate area for this operator. The first test was a failure after slight oil shows. The discovery is 2 miles northeast of the recently discovered Buffalo pool.

WYOMING

Grieve Unit Discovery Data Released

Forest Oil Co. has released data on its discovery in the Grieve Unit southwest of Casper in Natrona County. The well, 22-1 Morton produced 1,220 bbl. of oil per day through ¼-in. choke. Production is from the Muddy zone of Thermopolis shale at 6,723-80 ft. The well had previously been reported only as producing "more than 1,000 bbl. per day from small choke from an unidentified formation."

A second well on this unit, 2-22-2 Unit, NE NW NW 22-32n-85w flowed at the rate of 972 bbl. of oil per day, also through ¼-in. choke. Production was from the same zone. A third test, 3-28-1 Unit, C NE SW 28-32n-85w was abandoned at total depth of 7,308 ft. in Tensleep, and did not find the Muddy zone developed. Forest is now drilling a fourth Grieve Unit well.

(Continued on page 184)

Forest Oil Corp. has released all information on 22-1 Morton, Grieve Unit discovery in Natrona County. Production is from the Muddy zone of Thermopolis shale (Cretaceous.) The discovery was completed for 1,220 bbl. of flowing oil per day on ¼-in. choke.

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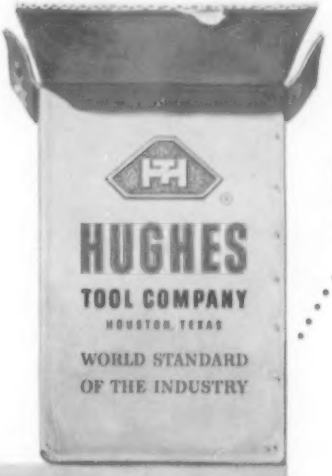

The clockwork delivery of HUGHES bits to your rig is assured before you spud in.

This is made possible by the 400-man HUGHES field service organization working closely with operators in every drilling area in the United States and Canada. Their combined estimates become the basis on which HUGHES' manufacturing schedules are set up.

That's why bits of the correct sizes and types move into our strategically located warehouses well in advance of actual requirements . . . and why you can depend on your HUGHES field service man to have the right bits on your rig at the right time.

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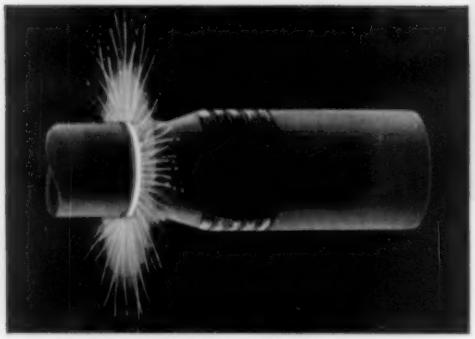
The performance records of these joints in thousands of wells prove they make the most dependable drill stem you can run in your well. And that they cost you less per foot of hole drilled!

When you specify HUGHES you get the *original Flash-Weld* tool joint . . . and the drilling industry's greatest flash-welding experience.



FLASH-WELD

A DEVELOPMENT

OF

HUGHES

TOOL COMPANY

HOUSTON, TEXAS

PERSONALS

Caine Raised

Tide Water official to head planning for new refinery

WHEN Tide Water Associated Oil Co. announced that it was abandoning its 87,500-bbl. refinery at Bayonne, N. J., George C. Caine felt as if he were being moved out of his home.

Caine, who served as general superintendent of the plant until he was named recently to head planning for Tide Water's proposed new East Coast refinery, has been at Bayonne since joining the company in 1926. He started as an engineer in the development department.

Born in the tongue-twisting town of Wissahickon, Pa., he spent his boyhood in the Pennsylvania town of Conshohocken. Caine fell in love with engineering as a boy and decided then that he would enter the field after completing his education.

Schooling . . . He enrolled at Massachusetts Institute of Technology, where in addition to his studies, he was active in sports, playing guard on the basketball team and throwing the discus in track. After graduation, he took postgraduate work for his M.S. degree and also completed a joint industrial practice course in steel, paper, and chemicals.

After a year in Tide Water's development department, he was promoted to assistant to the supervisor of the paraffin and lubricating department. In 1931 he became assistant processing superintendent and in 1938 advanced to assistant general superintendent, a post he held until promoted to general superintendent in 1943.

When Tide Water's executives decided to junk Bayonne, Caine's experience in the company's refining methods made him a logical choice to build the new refinery, which will have a capacity of more than 100,000 bbl.

Other activities . . . Caine's sporting muscles still call for action occasionally, and he and Mrs. Caine and their 16-year-old daughter enjoy outdoor recreation as much as possible.

He also contributes a goodly share of his time to civic activities in Bayonne. He serves as vice president of both the Chamber of Commerce and the Industrial Y.M.C.A. and is a vice president and member of the board of the Bayonne hospital.

W. B. Butcher has been named production superintendent of Affeld Oil Co., Robinson, Ill.

M. H. Standley has been transferred to New Orleans as a reservoir engineer by Shell Oil Co. Before his transfer, he was an exploitation engineer at Westwego, La.

Lavoice H. Carroll has been promoted to district geologist at Tyler, Tex., by Stanolind Oil & Gas Co. Before his promotion, Carroll had been serving as area geologist with Stanolind at Abilene, Tex.

M. Willcocks, former assistant manager of the Shell Haven refinery of Shell Refining & Marketing Co., Ltd., has been appointed manager of the company's Heysham refinery in England. He succeeds **H. E. F. Pracy,** who has retired after 27 years' service with the Shell organization in Britain and abroad.

George B. Parks has been named to the newly created post of general manager of Kerr-McGee Oil Industries, Inc. Before his promotion, Parks had been serving as production manager. Other promotions announced by Kerr-McGee are **William F. Baxter,** former superintendent of drilling, named manager of drilling operations of the Gulf Coast division; **G. Otis Danielson,** former assistant manager of the drilling department, promoted to manager of drilling operations for the Mid-Continent and Rocky Mountain divisions; **Charles F. Miller,** former general superintendent of the production department, advanced to manager of the production department, succeeding Parks; and **Burrell Taylor,** chief production engineer, promoted to general superintendent of the production department.

William L. Horner, vice president of Core Laboratories, Inc., Dallas, has been appointed a member of the Engineering Committee of the Interstate Oil Compact Commission by its chairman, Johnston Murray, Governor of Oklahoma, following the request of Allan Shivers, Governor of Texas.

DAN L. GARDNER

Dan L. Gardner has been named executive assistant at the Tulsa office of Warren - Bradshaw Exploration Co. Gardner, who formerly was associated with Deep Rock Oil Corp., is a petroleum - engineer graduate from the University of Kansas. **G. B. Parrish,** former district drilling superintendent of the company's

G. B. PARRISH

D. R. SCHULZ

West Texas-New Mexico district, has been transferred and promoted to division drilling superintendent with headquarters at Oklahoma City. **J. L. Gilbert,** former district drilling superintendent of the northern Oklahoma-Kansas district, has been transferred to Midland, Tex., as district drilling superintendent of that district. **John Jerome,** who has been with the company as a toolpusher the past 7 years, has been named district drilling superintendent for northern Oklahoma-Kansas district. **David B. Schulz** has been named drilling engineer with headquarters in Tulsa. Schulz was with Livermore Drilling Co., of Lubbock, Tex., before joining Warren-Bradshaw recently.

Charles S. Jones, president of Richfield Oil Corp., has been elected to his second term as president of Western Oil and Gas Association. Other new officers are **John W. Hancock,** Hancock Oil Co., reelected first vice president; **S. F. Bowlby,** Shell Oil Co., second vice president; **T. H. Wallace,** Western Gulf Oil Co., treasurer; and **Felix Chappellet,** reelected vice president and general manager. Newly elected members of the board include **J. M. Feldman,** Golden Bear Oil Co.;

PERSONALS

Fred M. Keller, Oceanic Oil Co.; **Emil Kluth,** Pacific Western Oil Corp.; **Ross McCollum,** National Oil Co.; and **Jasper W. Tully,** Reserve Oil & Gas Co.

David Smith, Edmonton, has been elected to the board of directors of Mid-West Refineries, Inc., of Grand Rapids, Mich. Smith was formerly associated with Superior Oil Co. and at present is an independent operator in Canada.

H. M. Stanier, Sunray Oil Corp., has been elected chairman of the Pacific Petroleum Chapter of the American Institute of Mining and Metallurgical Engineers. **Sam Patterson,** Bankline Oil Co., and **Milan G. Arthur,** Union Oil Co., have been elected council members.

J. M. Harbison, former assistant production superintendent for Kewanee Oil Co., has been promoted to production superintendent to succeed **W. O. Albert,** who retired December 1. Harbison joined Kewanee as district engineer at Maljamar, N. M., in 1941. After serving in the Army during World War II, Harbison rejoined the company in 1945 as district engineer at Pampa, Tex. He was promoted to division superintendent in 1950 and to assistant production superintendent in 1952.

Herbert G. M. Fischer has been appointed manager of the newly created office of refinery liaison by Standard

FISCHER

RICHARDSON

Oil Development Co. Fischer has been with Standard Oil Co. (N.J.) affiliates since 1922 and has devised many refining techniques including the process for producing white oil used in medical and cosmetic preparations. **Dr. Roger W. Richardson,** who joined the company in 1933, has been named associate manager. Richardson was named an assistant director of Esso Laboratories at Baton Rouge in 1940 and was advanced to associate director in 1947. One of Richardson's four sons, Hamilton (Ham) is a member of the U. S. Davis Cup team, which recently defeated Australia to regain possession of the trophy.

Permian Basin Society Officers Elected

Permian Basin Crude Oil Representatives Association with headquarters at Midland, Tex., recently elected its slate of officers for 1955. The association is made up of 28 members who represent 15 purchasers of crude oil in the Permian basin. The officers are, left to right, W. T. Shirey, Sinclair Crude Oil Co., treasurer; W. D. (Bill) Kleine, Phillips Petroleum Co., vice president; Guy M. Willis, Pan American Production Co., president; John A. Mills, The Texas Co., secretary-editor; Glenn L. Shoemaker, Stanolind Oil Purchasing Co., and Robert L. Denton, Magnolia Petroleum Co.

Robert S. Miller and **Karl J. Sax** have joined Shell Development Co. at the firm's Emeryville, Calif., research center. Miller recently received a Ph.D. in chemical engineering from the University of Wisconsin, and Sax received his Ph.D. in chemistry at Yale University.

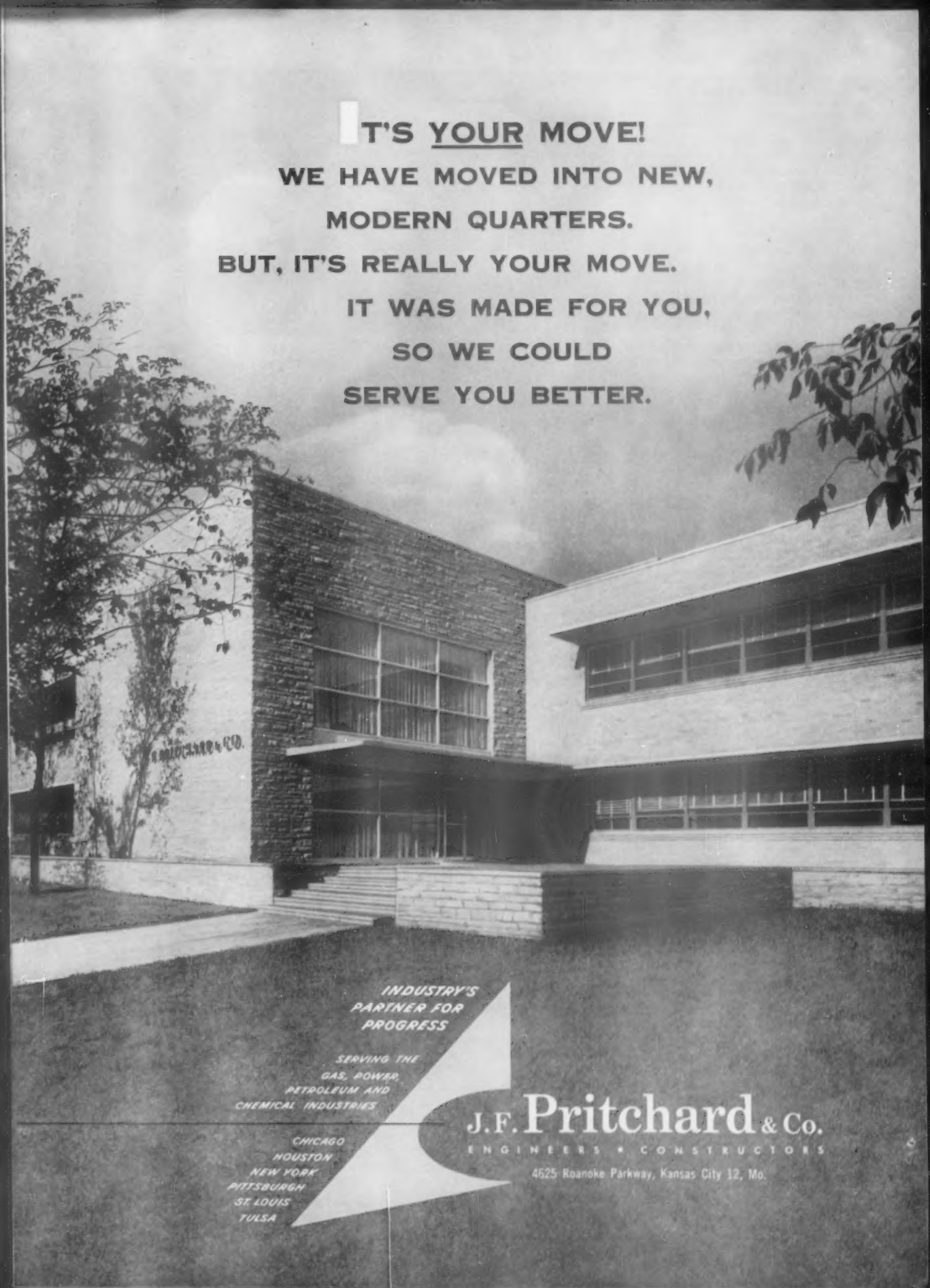
W. Z. Ganskopp, Creole Petroleum Corp., has been transferred from Jusepin, Venezuela, and appointed head of the gas-gasoline section of the production department in Caracas. Other recent personnel changes by Creole include **William G. Aertker,** formerly senior administrative analyst, organization and procedure staff, named supervisor, community-integration committee, coordinator's office, executive department, Caracas; **W. A. Austin, Jr.,** transferred from Tia Juana to become supervisor engineer, engineering subsection, pipeline section, production department, Caracas; **D. H. Bancroft,** transferred from International Petroleum Co., Ltd.'s, Colombian operations to become Creole assistant district superintendent at Lagunillas; **E. R. Bower,** transferred from Maracaibo to Caracas as supervisory petroleum engineer, production department; **C. F. Lindsley, Jr.,** named secretary to the executive committee, Caracas; **D. C. Meyer,** appointed head of the geophysical section of the geological department; **L. F. Neumann,** appointed supervisor of the organization and procedures staff and chairman of the Caracas materials standard subcommittee, succeeding Lindsley; **Dr. G. R. Pierce,** appointed supervisor, geological field parties, geological department; **M. A. Rodriguez,** named supervisor, office services of the administrative section, production department, Caracas; and **R. L. Towne,** transferred to Tia Juana district as senior engineer, pipeline.

Fletcher F. Farrar has been named chairman of the board and president of Inland Petroleum Co., Miami, Fla. Farrar, a former geologist with The Texas Co. in Tulsa and Illinois, has been an independent producer since 1950 at Mount Vernon, Ill.

James T. Rothenberger has been promoted to general maintenance superintendent by General Petroleum Corp. at its Torrance, Calif., refinery. Rothenberger, who joined General Petroleum in 1933, had been serving as assistant maintenance man since 1947.

Charles L. Bernard, division manager of Pure Transportation Co.'s Tulsa division, has retired after 43 years with Pure and its predecessor companies. **Norvel F. Gambel,** assistant manager of the division, has been appointed to succeed Bernard.

John O. Campbell, Jr., assistant head of Carter Oil Co.'s crude-oil and gas-sales department, has been named head of the department. He replaces **Dan W. Cameron,** who resigned. Campbell joined Carter in 1939 and has served


IT'S YOUR MOVE!
WE HAVE MOVED INTO NEW,
MODERN QUARTERS.
BUT, IT'S REALLY YOUR MOVE.
IT WAS MADE FOR YOU,
SO WE COULD
SERVE YOU BETTER.
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PERSONALS

in various field engineering capacities. He was general-gasoline superintendent for the company from 1948 to 1953. **Joe C. Kahl,** secretary of the executive committee, has been named to succeed Campbell.

V. E. Hanes has been named chief geologist of Nebo Oil Co., Dallas. Hanes had been serving as district geologist with Drilling & Exploration Co., Inc., at Midland, Tex.

C. Frederick Shepherd, independent geologist, has been named president for 1955 of the Dallas Geological Society. **Holland C. McCarver,** Seaboard Oil Co., is vice president, and **Dan E. Boone,** geologist for G. Scott Hammonds, is secretary-treasurer.

Clyde F. Dowd, manager of Tide Water Associated Oil Co.'s eastern division traffic department, has retired after 33 years of service with the company. He joined Tide Water in 1921 as traffic manager in the Tulsa office. In 1934 he was transferred to the eastern division, and in 1941 he was advanced to manager. Dowd was recently elected to the Transportation Club of American Petroleum Institute.

E. J. Wacker has been named vice president of Magnolia Pipe Line Co. in charge of the engineering, communi-

E. J. WACKER

D. R. WALL

cations, and electrical departments. **D. R. Wall** has been promoted from assistant manager to manager of its crude-oil purchases and sales department. For the past 2 years Wacker has been working in New York for Magnolia's parent firm, Socony-Vacuum Oil Co., Inc. He joined the company in March 1939 as a mechanical engineer. He was named chief mechanical engineer in 1947, assistant western division superintendent at Midland, Tex., in 1951, and was returned to the Dallas general office in 1952. Wall joined the company in 1941 as an office boy. He became Oklahoma representative of Magnolia's crude-oil purchases and sales department in 1948, was transferred to Wichita Falls in 1949, and was promoted to senior administrative assistant of the crude-oil purchases and sales department in Dallas in 1951. He became assistant manager the following year.

Richard J. Plank has been elected a vice president of Peoples Natural Gas Co., of Pittsburgh. Plank will continue his duties as general superintendent of the firm.

Julian C. Ashby has joined Utex Exploration Co., Inc., at Moab, Utah, as chief geophysicist. Before going with Utex, Ashby had been serving with Atlantic Refining Co. as district geophysicist at Bismarck, N. D.

E. W. Scudder, manager of the Denver area for J. M. Huber Corp., has retired. Scudder, who joined Huber in 1945, has previously served with Gulf Oil Co. for 23 years. **Leo Hantz** has been named to succeed Scudder.

John D. Rogers has been appointed an engineer in the newly created products development section of E. I. du Pont de Nemours & Co.'s petroleum chemicals division. Rogers had been working on automotive combustion problems.

Archie D. Gray has been elected associate general counsel of Gulf Oil Corp. Gray joined Gulf in 1935 and since 1947 had been serving as associate general attorney for the firm. **Russell G. Connolly** has been elected secretary of Gulf. Connolly has been associated with the company since 1948.

Joe B. Jenkins, Stanolind Oil & Gas Co., has been elected chairman of the West Central Texas section of the American Institute of Mining and Metallurgical Engineers. **Jim Russell,** Abilene, Tex., engineer, was named first vice chairman; **Harold Lacik,** Warren Petroleum Corp., second vice chairman; and **L. G. Neely,** partner in Neely & Neely, Fort Worth independent, secretary-treasurer.

Paul Wolff, former chief marine engineer of Kerr-McGee Oil Industries, Inc., has been named chief engineer of the firm. Wolff, who joined Kermac as manager of the marine department in 1952, will move to the Oklahoma City offices of the company from Morgan City, La. Wolff played a major part in the recent development of Kermac Rig 44, a $2 million offshore submersible drilling platform which is now completing its first well for Shell Oil Co.

R. D. Turner has been appointed special assistant to the president in charge of natural-gas sales by Skelly

L. L. BYARS

R. D. TURNER

Oil Co. Turner, who has been with Skelly for 33 years, will be responsible for the sale of gas from all of the company's producing leases. **L. L. Byars** has been named manager of the gas division of the manufacturing department. Byars, who has been with Skelly 17 years, will be in charge of procuring gas for the company's natural-gasoline plants and the sale of residue gas from these plants.

A. L. (Al) Carpenter, Humble Oil & Refining Co., Odessa, Tex., is the 1955 chairman of the Permian basin section of the American Institute of Mining and Metallurgical Engineers. Other new officers are: **R. M. Leibrock,** Stanolind Oil & Gas Co., Midland, Tex., vice chairman; **Gene Scheilcutt,** Lane-Wells Co., Odessa, vice chairman; and **Maynard Russell,** Dowell Incorporated, Midland, secretary-treasurer.

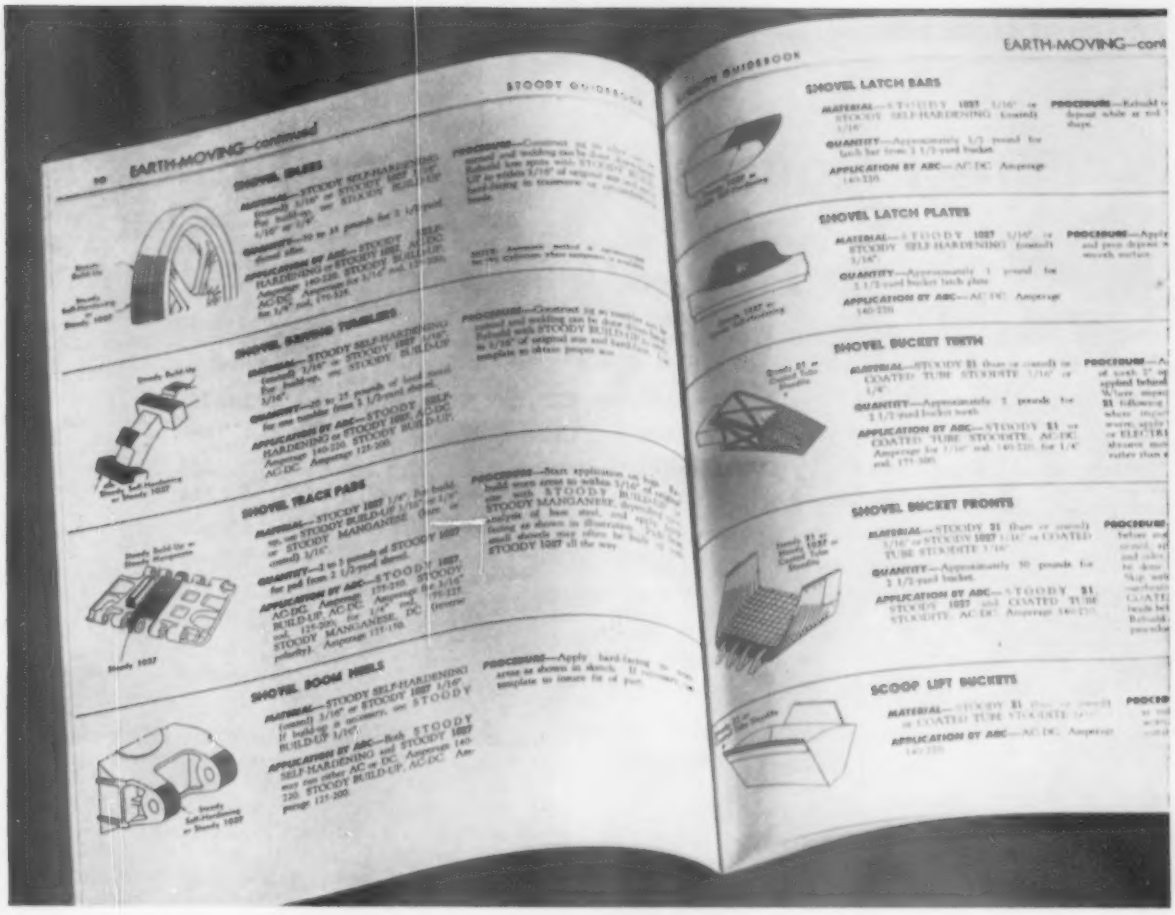
DEATHS

Jack Herley, 58, veteran of California's Signal Hill oil-discovery era, died recently in a Rochester, Minn., hospital. Herley was president of Western States Drilling Co., vice president of International Drilling Co., and a member of the firms of Herley-Kelley Oil Co., and Elliott-Herley-Marshall Oil Co.

John Peale de l'Eau, 65, Los Angeles petroleum engineer and geologist, died recently in a hospital there.

Kersey F. Coe, retired executive with Standard Vacuum Oil Co., died recently at his home in New York City after a long illness. Coe was an executive with Stanvac from 1933 to 1948, when he retired.

Amos Ball, 77, former vice president of Standard Oil Co. (Ind.), died recently at his home in Cocoa Beach, Fla., of a heart ailment.



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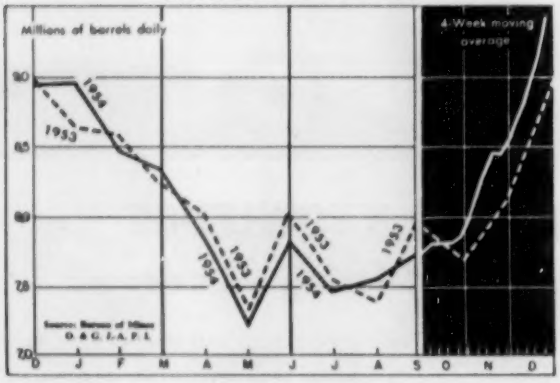
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,365,900	UP	17,300	UP	103,159
Crude stocks	265,493,000	UP	120,000	DOWN	11,673,000
Completions	1,102	DOWN	66	UP	114
Refinery runs	7,288,000	UP	62,000	UP	277,000
Gasoline stocks	154,922,000	UP	3,144,000	UP	969,000
Four-product stocks	350,332,000	DOWN	3,729,000	DOWN	324,000
Total imports	1,087,200	DOWN	265,700	UP	119,300

TOTAL DEMAND – ALL OILS



Crude-Producing States Scramble For Increased Crude Market

TOTAL demand of about 9,500,000 bbl. daily in December and even slightly higher potential demand in January form a firm basis for some increases in crude production for January, but announced or proposed increases in allowables may result in a very rapid gain in crude stocks unless state regulatory bodies reduce production as soon as the peak demand season is over.

The Texas Railroad Commission increased the producing-day schedule for January to 18 days compared with 16 days for December. Texas had been on a 15-day schedule for 4 months prior to the increase to 16 days in December.

Oklahoma production, which averaged about 555,000 bbl. daily in 1953, was cut back in the last half of 1954 to about 485,000 bbl. daily. With a better outlook for crude demand in January, pressure has grown for a return to higher allowables after the first of the year.

Cuts in Louisiana production were not severe until after the middle of 1954. Production for the year was down about 4.1 per cent from 1953 but was up about 0.7 per cent from 1952.

Since there is some question about who has been getting the larger portions of crude gains, the following table is given to show some of the comparative production data for the areas.

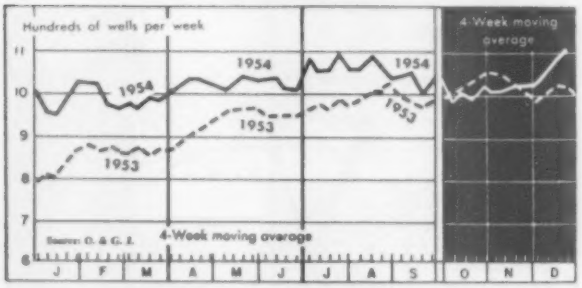
Competition is keen for markets served by Oklahoma, Louisiana, and Texas. Combined with Kansas and New Mexico, these account for most of the prorated crude. The Rocky Mountain area was added to the table to show the growth in production following increased pipeline capacity.

CRUDE PRODUCTION

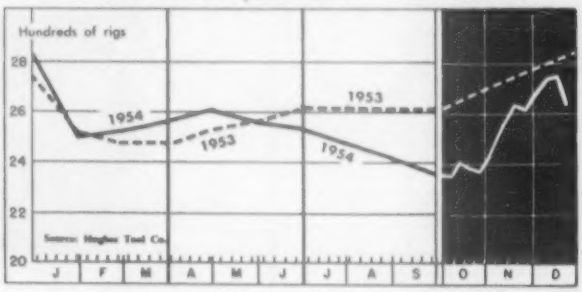
(Thousands of barrels daily)

	Oklahoma	Louisiana	Texas	Rocky Mtn.
1949	416	523	2,041	223
1950	450	573	2,274	263
1951	512	636	2,767	300
1952	520	667	2,793	312
1953	555	701	2,807	389
Per cent increase:				
Over 1952	6.7	5.1	0.5	24.7
1954	512	672	2,686	450
Per cent increase:				
Over 1953	—7.7	—4.1	—4.3	15.7
Over 1952	—1.5	0.7	—3.8	44.2
1954 production as per cent of reserves on 1-1-54	10.7	8.3	6.4	8.2
Per cent of U. S. production:				
1949	8.2	10.4	40.5	4.4
1950	8.3	10.6	42.1	4.9
1951	8.3	10.3	44.9	4.9
1952	8.3	10.7	44.6	5.0
1953	8.6	10.8	43.4	6.0
1954	8.1	10.6	42.4	7.1

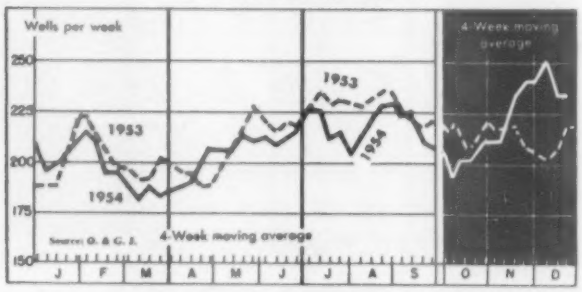
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

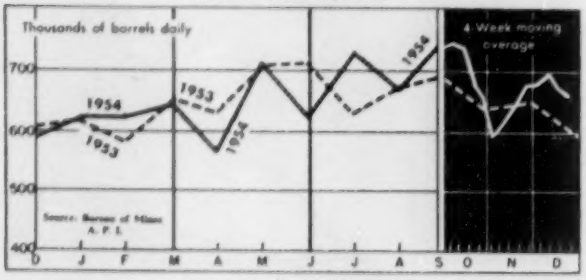
Area—	12-27-54	Change from 12-20-54	Change from 12-28-53
Gulf Coast	602	3	— 3
N. and W. Texas-New Mexico	812	— 79	53
Arkansas-N. Louisiana-E. Texas	197	— 3	— 2
Oklahoma	308	— 8	—54
Kansas-S. Nebraska	177	— 16	49
Illinois-Eastern	139	— 13	1
Rocky Mountain	249	— 2	—22
Pacific Coast	150		—20
Total United States	2,634	—118	2
Western Canada	196	— 15	33

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 25, 1954

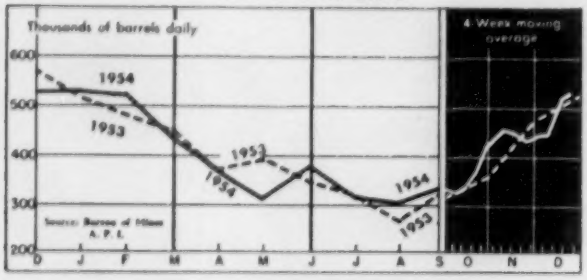
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1954	Cum. 1953	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1954: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	6,800	98	140	0	0	0	1	1	2	0	2	85	89
Arkansas	8	1	0	7	28,939	625	573	1	0	0	4	5	24	0	5	120	149
California	52	35	2	15	260,418	2,330	2,535	1	0	1	11	13	59	1	15	505	580
Colorado	34	7	1	26	171,294	1,345	729	1	0	0	20	21	40	0	21	568	629
Illinois	85	50	1	*34	190,831	3,130	2,186	0	0	0	10	10	27	0	1	428	456
Indiana	29	9	0	*20	44,317	866	1,300	0	0	0	6	6	9	0	1	209	219
Kansas	113	54	8	51	410,746	4,572	4,720	3	0	0	23	26	134	0	34	621	789
Kentucky	22	10	1	11	40,877	1,180	1,165	0	0	0	6	6	18	0	6	147	171
Louisiana	70	48	3	19	325,577	3,558	2,869	0	0	0	5	5	103	53	46	367	569
North	46	34	1	11	100,236	1,973	1,295	0	0	0	4	4	20	3	17	168	208
South	24	14	2	8	225,341	1,585	1,574	0	0	0	1	1	83	50	29	199	361
Michigan	17	5	0	12	42,885	559	611	1	0	0	5	6	18	0	0	211	229
Mississippi	12	2	0	†0	85,795	433	397	0	0	0	7	7	10	1	0	160	171
Montana	8	4	0	4	47,681	337	450	1	0	0	2	3	7	0	3	112	122
Nebraska	5	2	0	3	28,844	441	320	0	0	0	1	1	24	0	4	141	169
New Mexico	18	12	2	4	99,031	1,093	1,406	2	0	0	3	5	24	3	20	108	155
Northwest	2	0	2	0	5,026	373	615	0	0	0	0	0	4	0	18	44	66
Southeast	16	12	0	4	94,005	720	791	2	0	0	3	5	20	3	2	64	89
North Dakota	7	5	0	2	59,042	305	259	0	0	0	1	1	5	0	0	112	117
Ohio	17	5	3	*9	37,700	1,147	1,087	0	0	0	0	0	3	0	5	14	22
Oklahoma	175	110	11	†54	602,640	8,706	7,506	2	0	1	14	17	147	7	25	660	839
Pennsylvania-New York	36	8	12	‡16	92,514	2,153	2,262	0	0	0	0	0	0	0	7	36	43
Texas	372	222	15	135	1,596,659	18,315	17,003	11	2	2	71	86	761	68	161	4,068	5,058
Southwest (1 & 4)	53	32	0	21	220,856	2,565	2,705	1	0	0	11	12	106	26	43	709	884
Gulf Coast (2 & 3)	47	30	5	12	294,239	2,601	2,520	2	2	2	8	14	81	34	48	657	820
East (5 & 6)	33	16	3	14	129,204	1,005	808	0	0	0	9	9	17	0	14	294	325
North Central (7-B & 9)	124	63	1	60	392,329	6,935	6,465	3	0	0	28	31	349	4	23	1,654	2,030
West (7-C & 8)	99	73	2	24	502,655	4,265	3,735	5	0	0	15	20	202	1	24	678	905
Panhandle (10)	16	8	4	4	57,376	944	770	0	0	0	0	0	6	3	9	76	94
Utah	0	0	0	0	0	96	70	0	0	0	0	0	5	0	1	57	63
West Virginia	16	2	8	6	47,321	612	599	0	0	0	0	0	0	0	33	17	50
Wyoming	4	4	0	0	17,632	1,198	908	0	0	0	0	0	37	0	9	198	244
Miscellaneous (Idaho)	1	0	0	1	5,017	118	74	0	0	0	1	1	3	0	3	39	44
Total United States	**1,102**	595	67	440	4,242,560	53,217	49,169	23	2	4	191	**220**	1,460	133	401	8,983	10,977
Total previous week	1,168	620	114	434	4,616,896			34	1	12	186	233	1,437	131	397	8,792	10,757
Total December 26, 1953	988	547	72	369	3,895,105			31	0	7	166	204	1,421	108	352	9,078	10,959

Service wells included: *1, †8, ‡7.

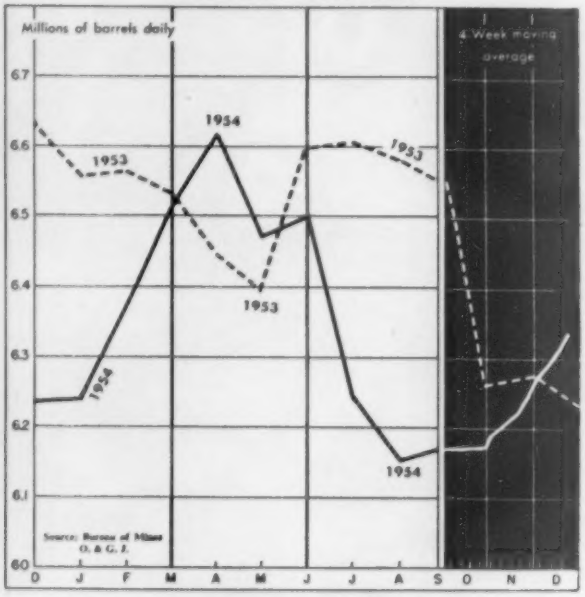
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

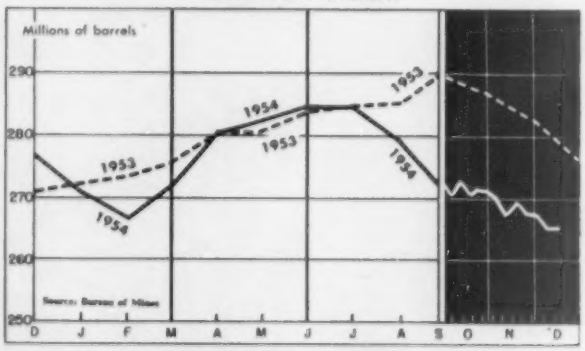


DAILY AVERAGE PRODUCTION FOR WEEK

	December 25 — Crude oil	Lease condensate	Total	Dec. 18 total
Alabama	3,900		3,900	3,900
Arkansas	71,500	400	71,900	72,200
California	965,700		965,700	965,100
Colorado	141,000		141,000	139,800
Eastern	51,000		51,000	49,800
Florida	1,400		1,400	1,400
Illinois	198,200		198,200	194,400
Indiana	28,900		28,900	29,200
Kansas	323,700		323,700	322,400
Kentucky	39,700		39,700	39,500
Louisiana	596,600	48,400	645,000	645,900
North	100,600	2,900	103,500	104,400
South	496,000	45,500	541,500	541,500
Michigan	31,900		31,900	31,800
Mississippi	89,500	3,800	93,300	93,300
Montana	35,800		35,800	37,700
Nebraska	22,900		22,900	22,500
New Mexico	212,650	2,550	215,200	215,000
North Dakota	21,200		21,200	19,600
Oklahoma	511,200		511,200	507,300
Texas	2,654,700	53,000	2,707,700	2,707,700
Dist. 1	46,000	475	46,475	46,475
Dist. 2	137,100	8,200	145,300	145,300
Dist. 3	416,000	25,000	441,000	441,000
Dist. 4	234,000	6,125	240,125	240,125
Dist. 5	43,000	500	43,500	43,500
Dist. 6	114,000	5,500	119,500	119,500
East Texas field	216,100		216,100	216,100
Dist. 7B	129,500	25	129,525	129,525
Dist. 7-C	175,000	4,550	179,550	179,550
Dist. 8	868,000	1,975	869,975	869,975
Dist. 9	192,000	625	192,625	192,625
Dist. 10	84,000		84,025	84,025
Utah	4,300		4,300	4,500
Wyoming	251,700		251,700	245,100
Others	†300		‡300	500
Total U. S.	6,257,750	108,150	**6,365,900**	6,348,600
Change from previous week up			**17,300**	
Canada	†302,300		†302,300	†312,400
Total U. S. Production January 1-December 25			2,275,455,225 bbl.	
Same period last year (crude plus cond.)			*2,322,399,012 bbl.	

*Includes 32,617,300 bbl. condensate. †Week ended previous Monday ‡S. D. 100, Nev. 200.

CRUDE-OIL STOCKS



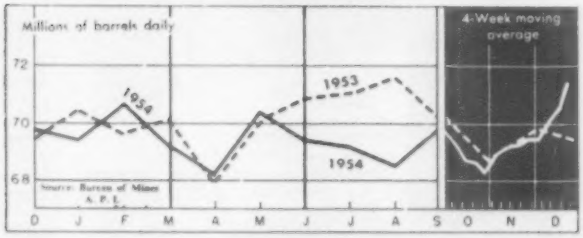
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

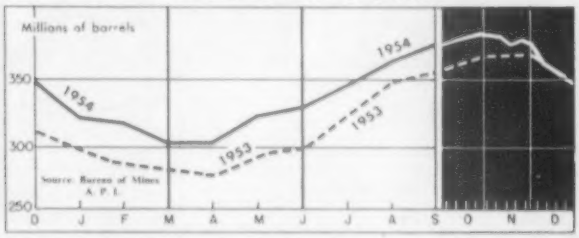
	Dec. 18, '54	Dec. 11, '54	Dec. 19, '53
Pennsylvania Grade	3,088	3,082	2,562
Other Appalachian	1,923	1,893	1,634
Illinois, Indiana, Michigan	12,208	12,402	12,390
Nebraska, N. Dakota	1,485	1,789	(‡)
Kansas	8,540	8,226	8,584
Oklahoma	25,774	25,521	27,011
Arkansas	3,013	3,163	3,301
Louisiana	14,876	15,543	17,848
North	2,441	2,364	3,025
South	12,435	13,179	14,823
Mississippi	2,930	3,103	3,452
New Mexico	8,886	8,053	8,881
Texas	120,807	120,340	129,051
East Texas proper	9,825	10,209	11,451
West Texas	54,444	52,862	56,284
Texas Gulf	23,714	24,457	26,054
Other Texas	32,824	32,812	35,262
Wyoming	13,515	13,374	13,729
Other Rocky Mountain	5,637	5,730	3,233
California	31,661	31,856	33,717
Foreign	†11,150	11,298	11,773
Total	265,493	265,373	277,166

*Bureau of Mines. †Includes 3,315,000 bbl. in California. ‡Included with Kansas.

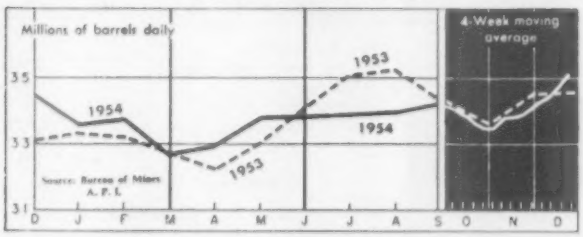
REFINERY RUNS



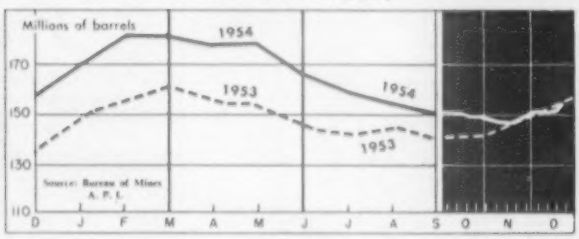
FOUR-PRODUCT STOCKS



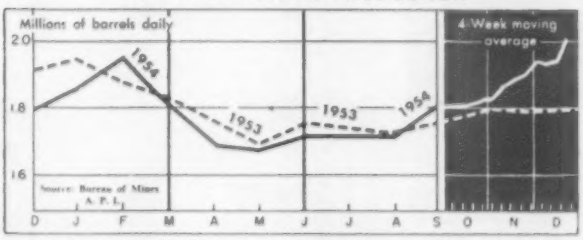
GASOLINE PRODUCTION



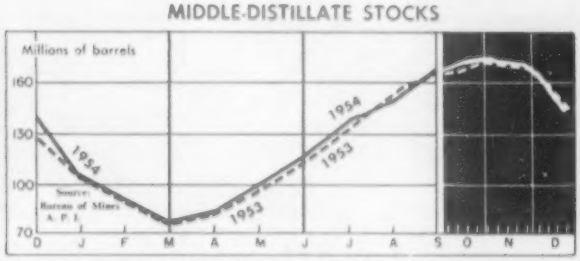
GASOLINE STOCKS



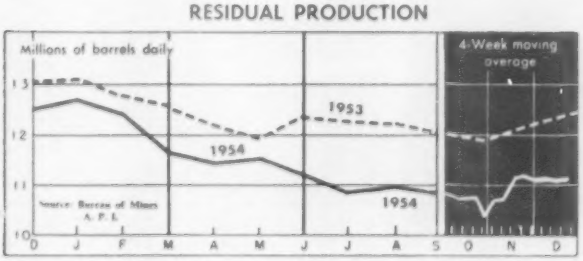
MIDDLE-DISTILLATE PRODUCTION



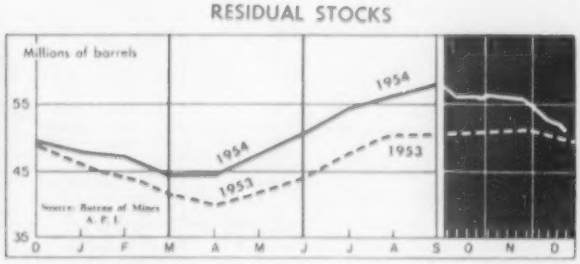
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, DECEMBER 24

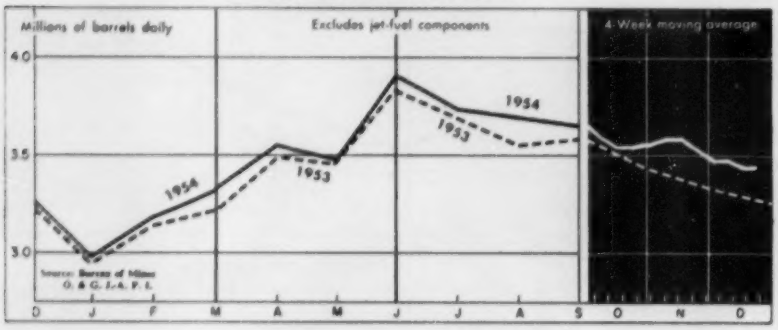
(Excludes all jet-fuel components)

(Thousands of barrels)

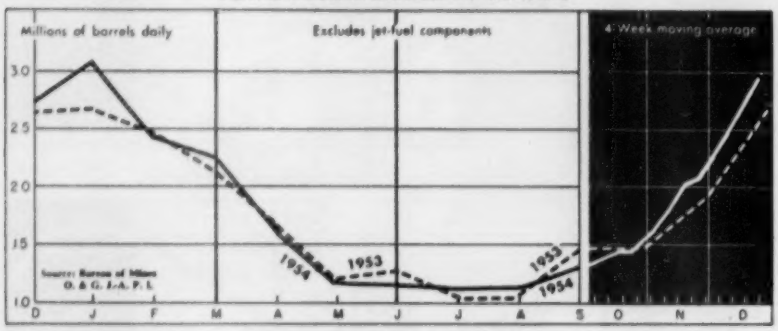
District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1954 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,046	432.7	42.0	287.1	245.3	32,847	11,872	40,641	8,869	1,018	446.4	44.3	232.9	227.1
Appalachian:														
District 1	101	42.1	8.1	21.6	6.7	4,549	559	2,177	470	118	50.6	6.0	25.7	13.1
District 2	76	36.0	6.3	15.6	12.3	2,401	449	669	212	81	44.7	5.7	15.7	11.1
Ind., Ill., Ky.	1,333	708.8	83.3	282.7	163.7	33,332	8,064	20,417	3,605	1,314	719.6	86.6	233.2	199.5
Okla., Kans., Mo.	662	380.9	21.3	173.7	49.2	14,245	2,005	11,619	1,258	572	353.4	11.1	124.3	48.7
Inland Texas	237	182.7	10.1	43.9	16.6	5,633	377	2,111	1,330	240	179.8	13.6	36.7	29.0
Texas Gulf Coast	1,780	842.9	145.3	457.4	235.1	22,957	3,342	15,598	4,503	1,655	812.3	128.7	399.2	243.6
La. Gulf Coast	610	309.0	65.3	179.4	28.1	11,227	2,328	4,370	1,097	549	288.9	60.7	134.3	50.2
N. La. and Ark.	87	33.4	6.1	23.9	8.1	3,736	884	1,536	151	83	35.6	10.3	19.3	7.0
Rocky Mountain:														
New Mexico	19	10.9		3.0	2.7	203		89	36	16	10.3	1.0	2.0	3.1
Other Rocky Mtn.	247	123.3	6.6	61.0	36.2	5,983	240	2,086	818	244	123.0	4.2	55.8	41.4
California	1,090	435.4	3.0	190.6	344.9	17,809	401	12,504	28,723	1,074	464.4	5.4	161.6	373.0
Dec. 24, 1954	7,288	3,538.1	397.4	1,739.9	1,148.9	154,922	30,521	113,817	51,072	6,964	3,529.0	377.6	1,440.7	1,246.8
Dec. 17, 1954	7,266	3,496.9	357.1	1,655.3	1,116.9	151,778	31,936	118,082	52,265					
Dec. 26, 1953	7,011	3,523.3	342.6	1,412.7	1,243.1	153,953	29,865	117,028	49,810					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

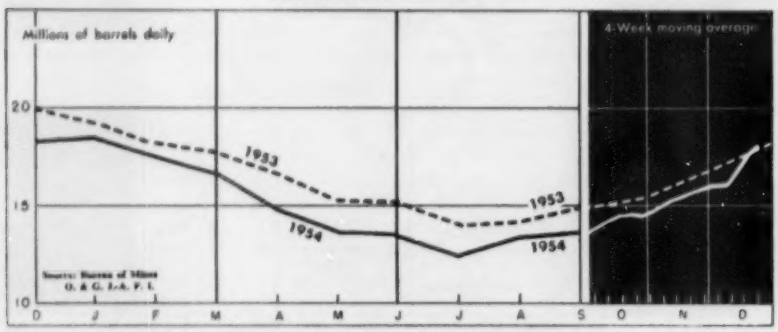
TOTAL GASOLINE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week moving average
1954
1953
Source: Bureau of Mines
O. & G. J.-A. P. I.
D J F M A M J J A S O N D

TOTAL MIDDLE-DISTILLATE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week moving average
1954
1953
Source: Bureau of Mines
O. & G. J.-A. P. I.
D J F M A M J J A S O N D

TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of December 29, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.375-11	11.25-12	10.50-10.75
Premium gasoline	11.375-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.625-9.75	10.7	9.25-9.5
No. 2 straw fuel oil	8.75-9.0	9.95	8.75-9.0
No. 6 residual	$1.45-1.55	$2.35-2.45	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX
Mid-Continent

132-134 A.M.P.	6.0

• Good heating-oil weather in the North Central area is boosting sales of distillate and residual fuels, but the presence of snow and sleet is tending to restrict gasoline use. Early December weather was clear and cold with excellent demand for both fuel and gasoline.

PRODUCTION AND DEMAND—MAJOR PRODUCTS
(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 12-24-54	3,509	3,412
September 1954	3,511	3,586
November 1953	3,444	3,330
December 1953	3,453	3,253
Middle distillate:		
Four weeks ended 12-24-54	2,009	2,986
September 1954	1,815	1,415
November 1953	1,785	1,926
December 1953	1,794	2,707
Residual fuel:		
Four weeks ended 12-24-54	1,118	1,794
September 1954	1,086	1,368
November 1953	1,223	1,654
December 1953	1,247	1,809

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, December 1, 1954.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.35
Middle District	3.25
Southwest Pennsylvania	2.93
West Virginia	2.82
Ohio	2.76
Illinois Basin	2.95

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1—MODEL RL 3-Drum Cardwell Powered with Buda Model 844D Diesel Engine. Rig and Engine in Perfect Condition. 1-87' 2-Pole Mast. Box H-404, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

FOR SALE—In Lindsay, Oklahoma field 7—high 500 bbl. erected flat seam used bolted steel tanks. Price $350.00 each, as is. Contact T. P. Mace, ME 6-3331, Oklahoma City, Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126 Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

CORE DRILLS-URANIUM. Power core drills for all depths. New and used spudders, rotaries, well drilling equipment and supplies. Compressors for air operation. Pressey & Son, Pueblo, Colo.

HALL SCOTT INVADER Engine Parts. New war surplus. large inventory, 50% to 75% discount, send for parts list. Abar Metals Company, 1902 E. Olympic Blvd., Los Angeles 21, California.

WILSON ATLAS—Bargain price; 2-LI-600 Cummins in good condition; enclosed oil-bath compound: includes one American and one plain cathead, one 1000 Gal. full tank. Call Madison 1923, Houston or Amherst 73311, Wichita or write P. O. Box 2001, Wichita, Kansas.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE EQUIPMENT

FOR SALE: 3600' 4½" extra hole drill pipe, good for shallow drilling, $.90 per foot. Terms. Melton Supply Company, Box 1360, Seminole, Okla.

FOR SALE—Truck mounted seismograph instruments of modern design, built by Southwestern Industrial Electronic Company, with multiple geophones and Vector Cable—Shooting truck with Griffin body complete with loading poles and blaster—Metal dynamite magazine trailer—Field office equipment—Also Power reel, Vector Cable with 12 geophones for Marine operation. Box H-554, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: One U-15 Rotary Rig, Complete. Jack Smith, 502 Combs-Worley Bldg., Pampa, Texas. Phone 4-2682 or 4-9614.

FOR SALE—At our Oklahoma City warehouse, one Ingersoll-Rand 8" x 3¼" x 8" portable compressor, 1000# starting pressure 500# operating pressure, price $1500.00. Cities Service Oil Company, Patridge Bartlesville, Oklahoma.

USED EQUIPMENT

Two Franks Model 4000-TM Single Drum Well Servicing Units. Single Pole Mast. Truck Mounted.
Franks Model Super East Texas Single Drum Well Servicing Unit. Truck Mounted. Handles 6500' work.
Franks Model East Texas Single Drum Well Servicing Unit. Single Pole Mast. Truck Mounted. Handles 5000' work.
Two Cardwell Models KS Single Drum Well Servicing Unit. Single Pole Mast. Industrial engine. Mounted on trucks.

50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.
Franks SAL 4500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma.
O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE: 2—Cardwell RL double-drum spudders complete with lines and tools, also spare 145 H.P. GKU motor and transmission. Now working in Oklahoma. Oklahoma City, Oklahoma, Phone ME 7-2242. Write: Box 4294.

FOR SALE at our Oklahoma City Warehouse 2850' 3½" OD 9.3# 10V thread used seamless steel upset tubing. Price 50 cents per foot. Take all. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE: 1—7¼" x 12" FZ-FXZ Gardner-Denver Pump unitized w/ Model 6LROU Waukesha Gasoline—Natural Gas—Butane Engine and #8A Demco Circulating Type Rod Oiler. Pump has been in use less than 60 days. Box H-545, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT SPECIALS!

Columns: 8' x 28', 7' 6" x 56', 7' 4" x 70', 7' x 5' x 70', (2) 7' x 57' (400#), 7' x 42', 6' x 63', 5' x 62', 4' x 72', 4' x 47', (250#), 3' 6" x 63', 2' 6" x 60', 2' x 75', 2' x 45' (250#).

Heat Exchangers:

(5) 1,660 sq. ft. (Adm.), (2) 1,125 sq. ft. (850 lb.), 1000 sq. ft., 600 sq. ft. (Adm.), (5) 424 sq. ft. (Adm.), (5) 360 sq. ft., (4) 260 sq. ft.

60—Turbine driven centrifugal pumps, SS & Steel, 1" x 1" to 8" x 8".

2—6-stage Pacific pumps 730 GPM. 2,000 ft. hd.

2—Clark MA-4 150 BHP engines.

4 IR XVG-8 engines.

Goulds 16" 10,500 GPM. Pump. 135 ft. hd.

Oliver Filters: 8' x 10', 5' 3" x 8'.

5' x 12', 4' x 6' Drum Flakers.

Lab. Petrochem Furnace.

Detailed circular upon request.

BRILL EQUIPMENT COMPANY
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New York Office, 2401 Third Ave.,
Telephone Cypress 2-5703
Sell us your surplus equipment

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

FOR SALE TWO LST'S UNCONVERTED

Original numbers 739 & 793 stored Lake Charles, La. Also, all or part of unused conversion equipment consisting of 40—Lake Shore type SWB Model 11 winches, motors & controls: 40—Cargo booms, cast steel boomsteps & topping lift swivel; 2—Superior Gen. sets Model GBD-8; 2—Capstan windlass with motor & controls; 24—Fassler kingposts 28" OD seamless steel pipe; 6—Buffalo axial flow exhaust fans motors & controls; 2—Hyde electric deck type gypsy windlass. No options will be granted. **Burrus Mills, Incorporated will not pay nor be responsible for payment of any commissions in connection with sale of these ships or equipment.** Sale is "as is." Terms cash within 15 days from acceptance of bid. **Burrus Mills, Incorporated reserves the right to reject any and all bids.** Bids will be opened 10:00 A.M., February 10, 1955. To arrange inspection and secure bid forms, contact Mr. R. D. Zumwalt, Vice-President Burrus Mills, Incorporated or Mr. A. M. Scott, Telephone PRospect 1881, Dallas, Texas.

FOR SALE EQUIPMENT

FOR SALE—Model 70 Keystone with cables & tools mounted on G.M.C. 6 x 6 with front end winch. Jim Schofield, Carrier Mills, Ill., Phone 3101.

FOR SALE—New Onan Generating gasoline engine light plant. Model 2 D.S. 2000 watt, 115 volts. Priced to sell. Herbert Ruff, Amanda, Ohio.

FOR SALE at Oklahoma City, 9—200 HP Bessemer Type X Gas Engine Compressor Units, equipped with 17" x 20" Bessemer or Baash-Ross overhead exhaust power cylinders and 7" or 8" x 20" high and 14" x 20" low compressor cylinders. Contact T. P. Mace, Oklahoma City Warehouse or Cities Service Oil Co., Patridge, Bartlesville, Oklahoma.

FOR SALE: Used Model 15-A-15 Fluor Aerator Cooling Tower. To be dismantled by purchaser. Frawley Corp., 8790 Hays, Culver City, Calif.

BEST NATIONAL 75 in Oklahoma. Complete L.C.M. derrick. New drill pipe. Plenty of extras. For inventory write Box H-562, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Cooper Type 80 Direct Gas Engine Driven Compressors, AS IS or reconditioned Compressor cylinders all sizes. W. S. Smith, 205 Thompson Bldg., Tel. 2-5473, Tulsa, Oklahoma.

WILSON MOGUL Drawworks, Unitized with:—Waukesha 145, 65' Telescoping Mast, Brewster Rotary Table, Brewster Swivel, all on 34' H Beam Steel Skids. Moves in one load. WILL SELL all of above for $12,500.00. C. M. BARRINGTON, Coleman, Texas. Phone 9-3345.

FRANKS 2000, Heavy Duty Core Drill, Tandem Trailer Mounted (with gooseneck): —Includes two Ford Industrial Type Power Engines that are practically new. Hydraulically raised derrick (for 20' drill Pipe), 5 x 8 Mudpump, Swivel, Blocks, Rotary Table. Also equipped with pull-down for fast shallow drilling. This is highclass rig for core drilling or shallow production. It is in excellent shape—WILL SELL for $17,500.000. C. M. BARRINGTON, Coleman, Texas. Phone 9-3345.

FOR SALE: Trailer Mounted Mayhew Model 3000 drilling rig with 87' Mayhew Mast complete with traveling equipment, rotary table, drawworks, engine, and substructures; but, less pump, pipe, and tools. Ideal for slim hole drilling to 6000'. Reed Drilling Company, Inc., 1408 First National Building, Tulsa, Phone 2-9638.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

LATE MODEL air unit or National drawworks, without engines, suitable 6000 ft. drilling. One package used gas compressor, discharge 800#, intake 350#, 750,000 ft. per day. Box 297, Tyler, Texas.

WILL CONSIDER buying or leasing used seismograph equipment and trucks. Must be in good condition and reasonably priced. Please give full description, prices and present location in first letter. Box H-565, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer See box heading for classified rates or write The Oil and Gas Journal.

COLUMNAR PADS—WORK SHEETS

DESIGNED FOR YOU!—Over 400 styles, sizes and kinds from which to choose. Sheets with 1 to 30 columns. Also horizontally-ruled sheets with no columns. Choice of Kraftbilt Green-Tint, Ivory, Canary or White Paper. Variety of sizes from 8½ x 11 to 14 x 25½ inches. Screened lines guide you without dominating entries. Ask for Catalog 654-P. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

JUNIOR PETROLEUM ENGINEER: Oil Company in Kansas has opening for Junior Engineer in Petroleum Engineering Section. Duties will include maintaining an oil treating program. Facilities are available in the company to obtain experience in exploration, drilling and production. Applicant must have a degree in Petroleum Engineering or equivalent. Experience not a requirement. Write Box H-559, The Oil and Gas Journal, Tulsa, Oklahoma, giving personal qualifications and salary expected.

MECHANICAL ENGINEER—Experienced in Design of Rock Bits. Excellent opportunity with expanding organization located in Southwest. Engineering Degree not necessary but at least two years college preferred. Work involves design and development of Rock Bits for Rotary Drilling. All replies confidential. Box H-560, The Oil and Gas Journal, Tulsa, Oklahoma.

PIERCEMENT SALT-DOME, subsurface geologist needed for work involving Louisiana Gulf Coast problems. Excellent opportunity for highly experienced man. HUNT OIL COMPANY, Dallas, Texas.

PETROLEUM ENGINEER with Masters Degree, or Doctor's in Chemical, Mechanical, or Petroleum Engineering, for research and teaching in Reservoir Mechanics and related fields at rapidly growing Southwestern institution. Rank and salary open, twelve months employment possible, consulting work encouraged and available in immediate area. Applications will be kept confidential. Box H-570, The Oil and Gas Journal, Tulsa, Oklahoma.

JUNIOR CHEMIST: Major oil research company has opening in Tulsa laboratories for a recent graduate chemist. Duties will include laboratory work of a routine nature and field process chemical studies. Experience not a requirement but preferably should have a degree in inorganic or physical chemistry. Write Box H-567, The Oil and Gas Journal, Tulsa, Oklahoma, giving personal qualifications and salary expected.

WANTED TO BUY:

Good used 16" OD x ¼" wall Plain End Gas Line.

CENTRAL PIPE & SUPPLY CO.

Box 1466—Phone SHerwood 4-7404
Lubbock, Tex.

ENGINEERS

for aggressive manufacturing company in midwest. Graduate engineers or engineering background, in design or development work for control equipment, used in oil and gas production. Organization also needs sales engineers experienced in above lines. Company offers excellent benefits with salary review every six months. Salary range $5000 to $7000. Company pays our service charges. All information confidential. Send resumes to

Chas. J. Loveless Personnel Service,
616 S. Main, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

Salaries commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 79

ARABIAN AMERICAN OIL CO.

505 Park Avenue, New York 22, N. Y.

HELP WANTED

WANTED: One Toolpusher, must have proven background, no floaters; when you prove your ability, you will get above average salary. When you reply, advise experience and where you worked before. Box H-558, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED and Capable Specialty Salesmen to sell valves to Production and Pipeline Divisions. Box H-568, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST

"Top young man; major Co. experience in Mid-Continent area. Excellent opportunity with rapidly expanding Co. in Kansas and Colorado. Contact Personnel Director, 352 N. Broadway, Wichita, Kansas.

TAX ACCOUNTANT

College graduate, minimum of 20 hours accounting. Experienced in analyzing Federal and State tax laws, regulations, and court decisions as to applicability to oil producing operations. Capable of making special tax studies and recommendations pertaining to purchase and sale of oil and gas properties. Salary minimum $6,000 per year. State education, age, and experience. Attach small photograph. Write Employment Supervisor, P. O. Box 591, Tulsa, Oklahoma.

GEOLOGIST

Independent oil company has opening in Tulsa office for qualified Geologist to direct geological operations in Mid-Continent area. Must have good experience, preferably with major oil company, particularly in Oklahoma. Must be well qualified to do mapping, logging interpretations, make lease and deal recommendations, and originate lease plays. Age limit 35. Give complete summary of experience and qualifications in letter. All replies confidential.

BOX H-544,

THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

SITUATIONS WANTED

MANAGEMENT WITH aggressive independent with opportunity to participate. Eighteen years experience, management land, production, and drilling departments. Box H-537, The Oil and Gas Journal, Tulsa, Oklahoma.

INDUSTRIAL LUBRICATION Specialist, 26 years training and experience in sales, application and technology. Services available full or part time in vicinity of Houston, Texas. Box H-553, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED OIL PROMOTER DESIRES CHANGE

Paying good salary with car furnished. Thoroughly familiar: 1. All phases leasing, Royalty buying & Drilling deals. 2. Rotary drilling procedures Rocky Mtn. area to Gulf Coast. 3. Promotional letter writing. 4. Promotional telephone solicitation. (Healthy, Husky, energetic, ambitious, close-mouthed, non-drinker). Reply by phone, wire or letter to Worth B. Andrews, Jr., 1112 Alamo Nat'l. Bank Bldg., San Antonio, Texas. Capitol 7-3523, Pershing 4-2406.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited

Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY

P. O. Box 1628, Hobbs, New Mexico,
Phone 3-3141.

146 Allen Building, Midland, Texas.
Phone 2-2962.

SITUATIONS WANTED

LANDMAN-GEOLOGIST desires retainer in Houston. Experienced in all phases of leasing, drilling deals, farmouts. Young, ambitious, family man. Box H-548, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED all around man, tool pushing, production superintendent, completions, workovers. Family man, 43 yrs. of age, sober. Best of references. Box H-569, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

WISH TO BUY producing royalties. Box H-379, The Oil and Gas Journal, Tulsa, Oklahoma.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bld., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

LEASE AND DRILLING BLOCKS

HAVE OPTION and geological reports on substantial blocks of acreage in Oklahoma, Illinois, Missouri, and Clayton County, Iowa, all in shallow areas. Will block leases, furnish geology, and make locations for percentage of acreage. For complete details write J. R. Schulte, 818 W. 13th St., Tulsa.

FOR LEASE: Solid block of twenty sections. Texas Panhandle. Ten year leases, fifty cents per acre annual delay rentals. Two dollars per acre bonus. Box H-564, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING AFTER January first, offset lease to 300 bbl. well with 25 ft. of sand. One thirty-second over-ride, $1,500. P. O. Box 26, Tulsa.

HAVE SEVERAL good drilling sites in California proven area, production close in, seeking someone to pay cost of drilling. Will complete wells at our expense share on a 50-50 basis, have excellent locations in Signal Hill, Long Beach, Huntington Beach. Box H-561, The Oil and Gas Journal, Tulsa, Oklahoma.

KANSAS WATER FLOOD oil lease for sale, has 1200 acres, five wells plus water wells, Gaso pressure pump, tanks and other equipment, owner Mr. O'Chamis, General Delivery, Chanute, Kansas, Ph. 1215.

SUPERIOR OIL CO. holds ½ of this mineral lease, will lease the other ½ interest, 64.4 acres undivided net of 96.6 tract, Young County, Texas. About 6 miles N.E. Eliasville. For 3 year lease, $100.00 per acre, OK as approved by attorney. Lessee to pay title check. Inquiries, P. O. Box 722, Clifton, Arizona.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

LEASES ROYALTIES

Producing and Nonproducing Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis, Mo.

DRILLING CONTRACTS OFFERED

KETA GAS & OIL COMPANY
NOW IN LIQUIDATION

. . . proposes to sublease or farm-out acreage to interested parties who will drill wells thereon. The company has substantial interests, by leaseholds and in fee, on major gas-producing and potential gas-producing structures in Pennsylvania.

At this time the company is offering acreage on the Cogan House structure, Lycoming County and Cherry Hill structure, Indiana County, Pa. Offerings will be in substantial blocks and on terms favorable to the driller.

Terms and specifications may be obtained by inquiring at the office of the company, 460 Market Street, Williamsport, Pa. Telephone Williamsport 2-6161.

Keta Gas & Oil Company

MAP CABINETS

END MAP-FILING WORRIES FOREVER! Kraftbilt Rolifiles keep rolled maps safe from dust, dampness, pilferers. Used by all major and hundreds of smaller oil companies. Send for new Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

PERSONAL

HICKEY: Wanted information regarding Nicholas P., Walter J., or Edward P. Hickey, all oil men who lived at Lexington, Ky. in 1921. Estate matter. W. C. Cox & Co., 208 S. LaSalle Street, Chicago.

PRODUCTION FOR SALE

SELL QUARTER Working Interest under 160 acres. One well flowing 45 bbl. per hr. 26 feet sand. $20,000 Cash. P. O. Box 26, Tulsa.

SOIL ANALYSIS

SOIL ANALYSIS
Learn a better method of finding oil. Test hydrocarbons from oil directly. Do it yourself. Free details. Surfac Oil Surveys Box 10216, Fort Worth 14, Texas.

BUSINESS OPPORTUNITY

RECENTLY ORGANIZED Eastern group with venture money for drilling of wildcats, development, farmouts. You are dealing directly with principals. Box H-538, The Oil and Gas Journal, Tulsa, Oklahoma.

RECENTLY ORGANIZED group seeking proven oil property with an income of $10,000 to $40,000 per month. You are writing directly to the principals. Prompt action Box H-526, The Oil and Gas Journal, Tulsa, Oklahoma.

PRINCIPAL WILL PURCHASE: Oil Property from Independent, or—**Producing Oil Co.** (stock or property).—**Oil Royalty Co.**, either stock or property where Purchase Price Valuation is $200,000.00 and up.

Box H-547, The Oil and Gas Journal, Tulsa, Oklahoma.

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

WANTED

DEPLETED LEASES—Kentucky—Waltersburg, Tar Springs, Weir, Berea Sands—Complete details in reply. Box 2, Clarendon, Penna.

ESTABLISHED Manufacturer's Agent desires additional lines, Production, Drilling, Industrial. Ark.-La.-Tex. area. Box H-550, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—IDEAS

Inventions that are related or can be adapted to the oil industry. We offer capital, technical advice, patent assistance, market research, a manufacturing plant, and a sales outlet; everything to put your invention on the market. Write P. O. Box 1665, Houston 1, Texas.

Will purchase producing oil properties of any size. This is direct contact with purchaser.

Send All Details To:—

MR. JACK DAVIS
DAVIS OIL COMPANY
105 W. 40th Street
New York 18, N. Y.

Equipment Men

Iverson Promotes Bryant to Store Manager at Kermit

T. E. BRYANT

H. E. KALEY

W. H. LONG

The promotion of Tom E. Bryant, field salesman at Farmington, N. M., to store manager at Kermit, Tex., has been announced by S. J. Iverson, president of Iverson Supply Co.

Harold E. (Hank) Kaley, with Iverson at Price, Utah, has been transferred to city and field sales in the Midland, Tex., office.

Wm. H. (Bill) Long, Jr., who has been associated with major supply companies in the mountain states has been employed by Iverson as city salesman of tubular goods at Oklahoma City.

Continental Names Hambric Assistant Division Manager

R. O. HAMBRIC

The appointment of Roscoe O. Hambric as assistant division manager of the Kansas - Oklahoma division, with headquarters in Tulsa, has been announced by Continental Supply Co. Since January 1953, he had served as a district manager in Wichita, Kans.

Hambric started with Continental in the Seminole, Okla., store in 1946. He has since held positions as city salesman, store manager, and assistant district manager.

R. A. Brewer is manager of the Kansas-Oklahoma division.

Lone Star Names Robertson As District Sales Manager

B. C. (Robby) Robertson, former purchasing agent for Kirby Petroleum Co.,

Houston, has been named district sales manager for Lone Star Steel Co.'s Houston office, according to Walter T. Moreland, vice president, sales. He replaces Rufus C. Sommerville, whose resignation to enter another field of activity was accepted effective December 31.

Robertson was with National Supply Co. from 1941 to 1943 when he entered the Air Corps. He joined National Supply to become district sales representative until his resignation in 1951 to become associated with Kirby Petroleum.

Delegates to Get Awards

LOS ANGELES.—Awards totaling more than $3,000 will be given by H & L Tooth Co. at the seventh annual convention of the Pipe Line Contractors Association in the Statler Hotel here January 17-19.

The company will display various sizes of H & L teeth in a cabinet, and awards will be presented to delegates guessing closest to the number of teeth on display. Two men's watches and a diamond-studded lady's watch also will be awarded to registrants.

A judging committee composed of one officer of the association, an official of H & L Tooth Co., and a certified public accountant will tabulate the ballots. Awards will be presented by E. L. Launder, H & L president, at the association's banquet January 19.

Exploration Highlights

(Continued from page 168)

WYOMING

Carbon County Madison Test Spudded

Sinclair Oil & Gas Co. is drilling below 2,000 ft. at 1 Unit, NW NW NE 4-27n-86w, in the Arkansas Creek area of Carbon County. The wildcat will test Madison at about 4,500 ft. It is 20 miles northeast of Wertz Dome which has production from Madison.

NORTH DAKOTA

Dunn County Test Abandoned

Cities Service Oil Co., Skelly Oil Co. and British-American Oil Producing Co. have abandoned the joint wildcat, 1 Clarke, C NE NW 17-145n-91w, Dunn County. Total depth is 9,070 ft. Slight shows were found in a considerable Mission Canyon section, but porosity was poor.

Stark County Wildcat Staked

Southern Production Co. and Texota Oil Co. have made location for 1 Wanner, NW NW 9-137n-97w, Stark County. It is 3 miles east of a wildcat by Plymouth Oil Co. which reported slight shows in Madison. The current wildcat will also test Madison at about 9,500 ft.

MONTANA

West Poplar Discovery Completed

Carter Oil Co. and Phillips Petroleum Co. have completed 1 Tribal, C SW SW 5-29n-50e, in the West Poplar Unit, Roosevelt County. The operators pumped 72 bbl. of 41°-gravity oil and 8 bbl. of water per day from C zone of Madison at 6,450-68 ft. The well is the first success in four tries on this unit for Carter and Phillips. It is 2 miles northwest of production in East Poplar field, and is the northernmost of the wildcats drilled on the unit.

California Company Locates For Rank Deep Test

The California Co. has made location for 1 Grimm, C NE SE 13-32n-49e, in the East Bredette area of Roosevelt County. The well will test Winnipeg at about 9,700 ft. There has been very little previous drilling in this area of the county. Ajax Oil Co. of Billings drilled a 7,004-ft. failure with no reported shows 4 miles southeast of the California Co. location in 1953.

New Shows Reported In Roosevelt Wildcat

Deep Rock Oil Corp. is reported testing at 1 LePage, C NW SW 14-28n-59e, Roosevelt County. The operator had previously reported recovery of good shows in Madison lime, and most recent reports indicate a recovery of 58 ft. of new core with good stain. The well has had shows from 9,082 ft. to present depth of 9,341 ft. A majority of the section showed poor porosity and permeability, however.

New Drilling Scheduled in Blaine, Phillips Counties

North-central Montana, which has had a considerable portion of the state's wildcat total during 1954, had two new wildcat locations announced late in December. Tidewater Associated Oil Co. will drill 1 Munsen-Torvick, C SW SW 9-37n-21e, in Blaine County. The well is to be a 5,000-ft. Mission Canyon test. It is 2 miles south of the Canadian border. The area has had no previous drilling.

In Phillips County, Carter Oil Co. has made location for 1 Solberg, C NW NW 35-32n-27e. It is 9 miles northwest of a failure drilled by Carter earlier in 1954, and is to test Devonian.

Gulf to Drill Dawson County Wildcat

Gulf Oil Corp. has made location for an 11,000-ft. test of Red River at 1 Schwarz, C SE NE 3-17n-52e, Dawson County. The well is 6 miles north and west of Deer Creek. It is also northwest of a dry hole drilled by Richfield Oil Co. in 1952. Gulf has not been active in its own right in this area prior to locating the present wildcat.

Successful Wildcats

TEXAS GULF COAST

Aransas County: C. G. Glasscock 2 State Tract 2, Copano Bay. IP 88.5 BOPD, 9/64-in., 44°, perforations 6,770-82 ft. TD 6,951 ft. (New pool discovery in North Fulton Beach area.)

Chambers County: McCarthy Oil & Gas Corp. 2 Frankland et al, Samuel Mather Sur. 12, A-190. IP 1,515 M.c.f. daily and 144.52 BCPD, 9/64-in., perforations 11,718-40 ft. TD 11,995 ft. (New gas-condensate pay in South Mayes field.)

DeWitt County: Kirkwood & Co. 1 Koenig, Charles Linn Sur., A-309. IP 5,000 M.c.f., open-flow potential, gas-condensate ratio 50,000 cu. ft. per barrel, 58.1°, Wilcox "A" sand 8,746-68 ft. (perforations). TD 9,015 ft. (New field 2 miles north of Arneckeville field.)

Fort Bend County: Sam E. Wilson, Jr., 1 Harris, John Randon Sur., A-76. IP 13,500 M.c.f. daily, open-flow potential, gas-condensate ratio 62,500 cu. ft. per barrel, 55°, perforations 8,388-8,428 ft. TD 8,617 ft. (New field.)

Galveston County: Superior Oil Co. 1-A Cooper Unit, I&GN Sur. 13, A-601. IP 145.11 BOPD, 7/64-in., 34.6°, perforations 9,538-41 ft. TD 12,415 ft. (Second well, new pay, and first oil production in Algoa field.)

Liberty County: John W. Mecom et al 1 Champagne et al, H&TC Sur. 193, A-239. IP 191 BOPD, 13/64-in., 32.6°, Yegua EY-1A sand, 9,150-74 ft. (perforations), and 223 BOPD, 11/64-in., 32.6°, Yegua EY-1B sand 9,057-9,106 ft. TD 9,177 ft. (Two new pays in Northeast Merchant field.)

Wharton County: Caroline Hunt Sands 1 Wychopem, BBB&C Sur. 1, A-80, IP 3,541 M.c.f. daily, 16/64-in., Frio 5,944-48 ft. (perforations). TD 6,200 ft. (New gas pay in Schmidt field.)

NORTH TEXAS

Grayson County: Humble Oil & Refining Co. 1 Davis, E. Jones Sur., A-625, 4 miles SW Sherman. IP 300 BOPD, ¼-in., 34.5°, TP 450 psi., GOR 542, Pennsylvanian perforations 8,132-42 ft. TD 10,317 ft.

Montague County: Nortex Oil & Gas Corp. 1 Fooshee, J. S. Hagler Sur., A-1607, 2½ miles NW Montague. IPP 84 BOPD, 36°, GOR 100, Strawn 4,675-82 ft. TD 6,413 ft.

Young County: Fowler & Grace 1 Jeffery, S. R. Jeffery Sur., A-1930, 5 miles NW

Graham. IP 203 BOPD, 21/64-in., 42°, TP 70 psi., GOR 400, Strawn pay 3,231 ft. TD 3,239 ft.

WEST TEXAS

Crane County: Gulf Oil Corp. 221 Waddell, 17-B21-PSL, 20 miles NW Crane. IP 894 BOPD, 32/64-in., TP 230 psi., GOR 660, 36.6°, top pay 6,030 ft. TD 6,408 ft. Ground elev. 2,599 ft.

Crockett County: Val Carroll Oil Co. 1 Todd, 15-10-GC&SF. IPP 30 BOPD, 32.6°, pay 1,580 ft. TD 1,619 ft.

Hockley County: Standard Oil Co. of Texas 1 Huffaker 2, Sec. 1, Track 4, Blk. D, EL&RR Sur., 12 miles W Lubbock. IPP 211.7 BOPD, 27°, GOR 151, Clear Fork pay 7,126 ft. TD 10,200 ft.

Reagan County: Phillips Petroleum Co. 1-C University, 35-9-University Lands, ½ mile E Santa Rita. IP 220.6 BOPD, ½-in., 54.3°, TP 400 psi., GOR 7,460, Pennsylvanian Bend pay 10,450 ft. TD 11,870 ft. Elev. 2,754 ft. Discovery of Big Lake, SW.

Yoakum County: Anderson-Prichard Oil Corp. 1 Hanks, 884-D-J. H. Gibson Sur., 17 miles SE Plains. IPP 216.6 BOPD, 34°, GOR 138, top pay 9,960 ft. TD 13,315 ft.

SOUTHEAST NEW MEXICO

Chaves County: Joseph I. O'Neill 1-A Medlin, 8-15s-31e. IP 461 BOPD, 20/64-in., 36°, TP 100 psi., GOR 200, Queen sand 3,115 ft. TD 3,132 ft.

Lea County: Texas Pacific Coal & Oil Co. 1 Cross Roads Unit, 10-10s-36e, 2 miles S Cross Roads field. IP 300 BOPD, 16/64-in., 42°, TP 150-50 psi., GOR 16, pay 12,254-92 ft., TD 12,433 ft. Elev. 4,024 ft., Devonian 12,250 ft.

ARKANSAS

Union County: Salem Church field discovery. V. S. Parham 1 Powell C-137, 100 ft. E of C E½ 33-16s-18w. IPP 84 BOPD, 175:1 GOR, Travis Peak 4,296-4,301 ft. 38.5°. TD 7,064 ft. (Oil discovery.)

OKLAHOMA

Garfield County: M&M Drilling Co. 1 Bennett, NE NE SW 30-20n-3w. IP 2,000 M.c.f. of gas per day, Perry gas sand 4,006-70 ft. TD 5,370 ft. (Gas discovery.)

Grady County: Phillips Petroleum Co. 1 Sterr, C NE SW 25-5n-5w. IPF 247 BOPD, first and second Bromide sands 12,096-12,351 ft.; 124 BOPD, Tulip Creek, Oil Creek, and McLish sands 12,410-13,312 ft., 53.1 and 51.4° gravity, 16/64-in. 1¼ miles north of Bradley. TD 13,364 ft. (Oil discovery.)

KANSAS

Barton County: Harms-Burt 1 Murphy, NE NE NE 23-20s-13w. IPP 190 BOPD, Lansing 3,336-41 ft., 3,373-78 ft. TD 3,510 ft. (Opens Southwest Sunny Valley pool.)

Pawnee County: Rine Drilling Co. et al 1 Lovett, NW NW NW 35-22s-15w. IPP 54 BOPD, Lansing 3,682-90 ft. TD 4,041 ft. (Opens Lovett pool.)

Derby Oil Co. and Honaker Drilling Co. 1 Boyd, SW SW SW 35-22s-17w. IPF 6 BOPD, Sooy 4,152-58 ft., 3,683 M.c.f. of gas per day. TD 4,270 ft. (Opens Jab pool.)

CALIFORNIA

Fresno County: W. W. Holmes & Associates 1 well, SE SE 25-19s-14e, IPF 1,000 M.c.f. gas through ¼-in. choke, perfs. 5,122-5,290 ft. in Joaquin Ridge sand, OWDD from 4,200 ft., TD 5,300 ft. (New gas discovery in West Coalinga area.)

Orange County: W. L. Meeker 1 Lomita Land, NE SW 20-5s-11w, IPF 840 BOPD, 16/64-in. choke, 31° gravity, 12 per cent cut, perfs. 7,900-8,000 ft., TD 8,352 ft. (New fault-block discovery in Sunset Beach area.)

MONTANA

Roosevelt County, West Poplar: Carter Oil Co.-Phillips Petroleum Co. 1 Tribal, C SW SW 5-29n-50e. IPP 72 BOPD, Madison discovery, new field. TD 6,565 ft.

COLORADO

Washington County, Plum Bush Creek: Kimbark Co., Ltd., and Sterling Drilling Co. 1 Porter, C SW SW 30-2s-55w. IPP 120 BOPD "J" sand discovery, new field. TD 5,150 ft.

SASKATCHEWAN

Central-Del Rio 14-6 Ralph, LSD 14, 6-7-13w2. Indicated Charles oil well. TD 5,124 ft.

ALBERTA

Merrill-Sun 4-19 Brooks, LSD 4, 19-18-15w4. Lower Cretaceous oil well (Indicated). TD 4,630 ft.

British-American-Cities Service 6-11 Gough Lake, LSD 6, 11-36-18w4. Basal quartz gas well. TD 5,401 ft.

Cuba 9 Troutman, LSD 9, 25-50-1w5. Cardium gas well. TD 3,280 ft.

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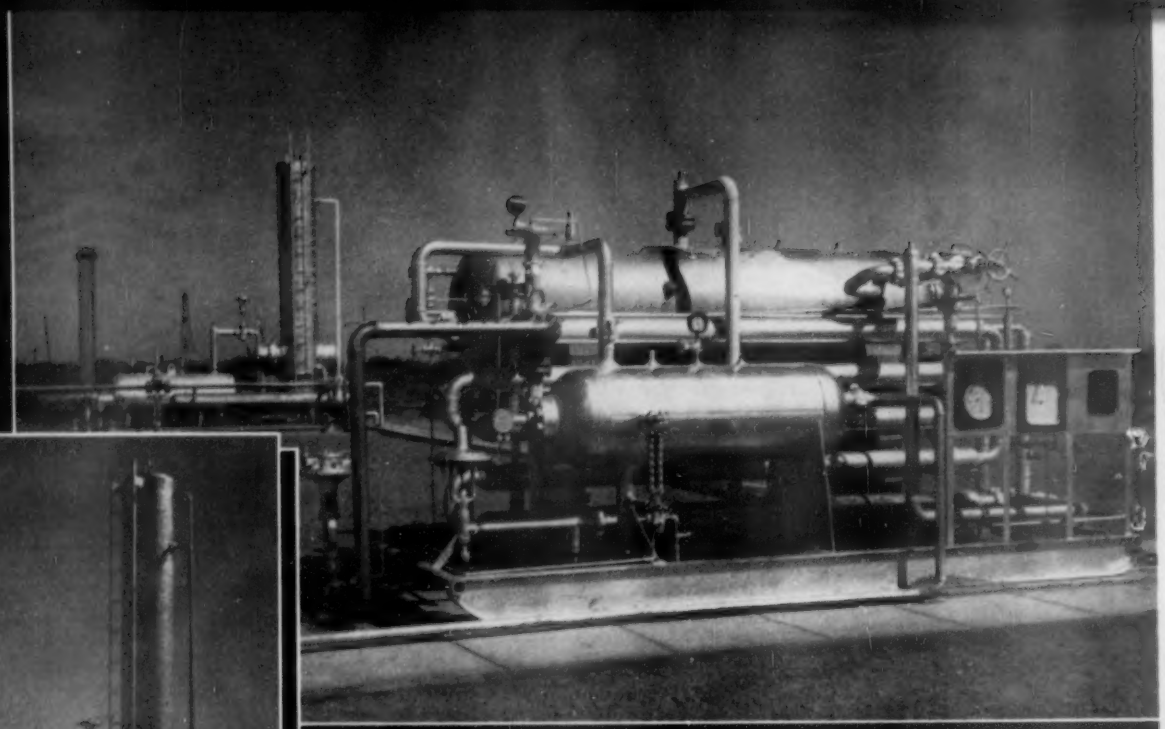
LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that three parcels of land containing 480 acres of land within the known geologic structure of the Bell Rock Field, Moffat County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T., February 16, 1955, when bids will be opened. Details of the lease offering, description of the land, how and where to submit bids, and bid forms may be obtained from the Manager of the Land Office, Denver, Colorado, or from the Director, Bureau of Land Management, Washington 25, D. C. L. E. Hoffman, Minerals Officer.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 11.62 acres of land in the NE¼ sec. 35, T. 58 N., R. 98 W., 6th P.M., within the known geologic structure of Frannie field, Wyoming, will be reoffered in one parcel for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 1:00 p.m., E.S.T., February 23, 1955, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms, may be obtained from the Manager of the Land Office, Cheyenne, Wyoming, or from the Director, Bureau of Land Management, Washington 25, D. C. L. E. Hoffman, Minerals Officer.



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